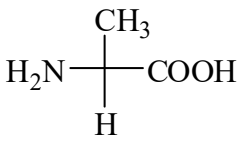
QUANTA CHEMISTRY CLASSES

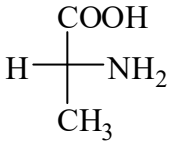
1

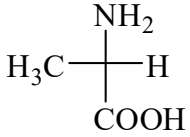
STEREOCHEMISTRY (PREVIOUS YEAR)

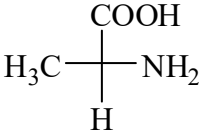
GATE 2001

1. Amongst the following amino acids, the (R)-enantiomer is represented by

(a) 

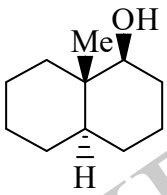
(b) 

(c) 

(d) 

GATE 2002

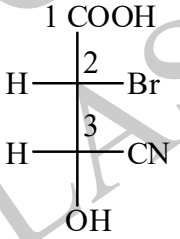
2. The configurations at the three chiral centres in the bicyclodecanol given below, are



(a) 1S, 2S, 6R (b) 1S, 2S, 6S (c) 1R, 2S, 6R (d) 1R, 2S, 6R

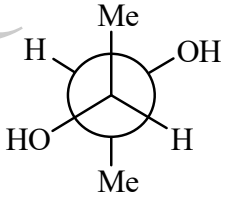
GATE 2003

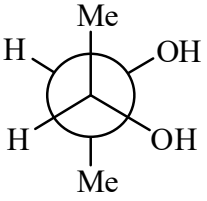
3. The absolute configurations of the two chiral centers in the following molecule are

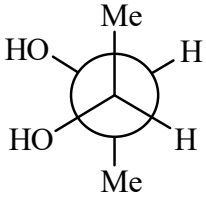


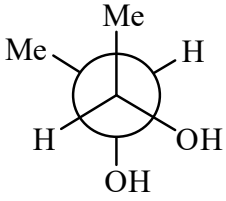
(a) 2(R), 3(S) (b) 2(R), 3(R) (c) 2(S), 3(S) (d) 2(S), 3 (R)

4. Among the following, the Newmann projections of meso-2, 3-butanediol are

(a) 

(b) 

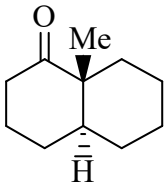
(c) 

(d) 

QUANTA CHEMISTRY CLASSES

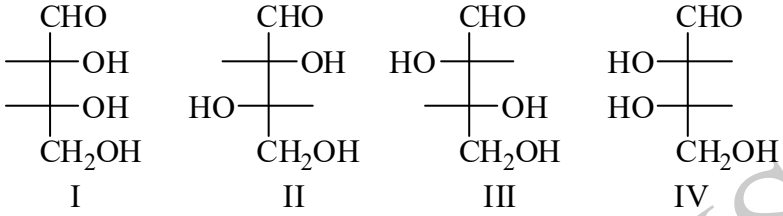
GATE 2004

5. The configurations at the two asymmetric centres (C–1 and C–6) in the bicyclo [4.4.0] decane, given below are



(a) 1R, 6R (b) 1R, 6S (c) 1S, 6S (d) 1S, 6R

6. For the aldotetroses I – IV, the combination of TRUE statements, among P – T, is:



P = I and II are diastereomers and II and III are enantiomers.

Q = I and IV are mesomers and are optically inactive.

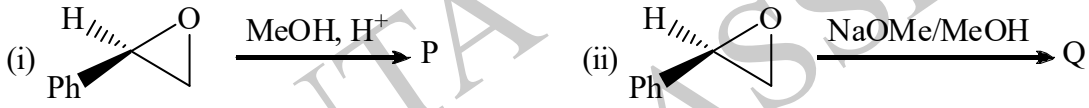
R = I and III can be interconverted by a base catalysed isomerisation.

S = only I and IV are HIO_4 cleavable.

T = I and III are D – sugars and II and IV are L – sugars.

(a) Q, R, T (b) P, R, T (c) Q, S, T (d) P, Q, S

7. For the reactions shown below, identify the correct statement with regard to the product formed.



(S) – styreneoxide (S) – styreneoxide

(a) P and Q are identical, both are optically active.

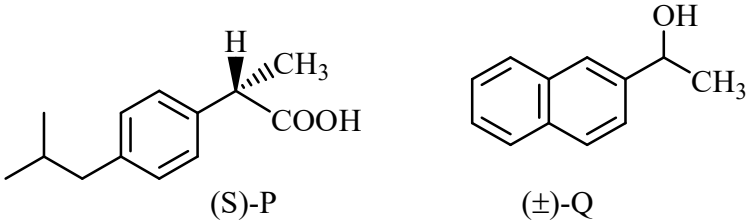
(b) P and Q are positional isomers, P is racemic and Q is optically active.

(c) P and Q are positional isomers, P is optically active and Q is racemic.

(d) P and Q are positional isomers, both are optically active.

GATE 2005

8. Esterification of the acid P with the alcohol Q will give



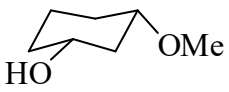
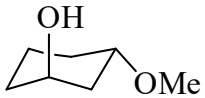
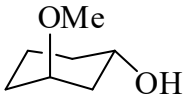
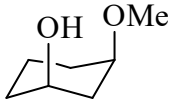
(S)-P (±)-Q

(a) Only one enantiomer (b) A mixture of diastereomers

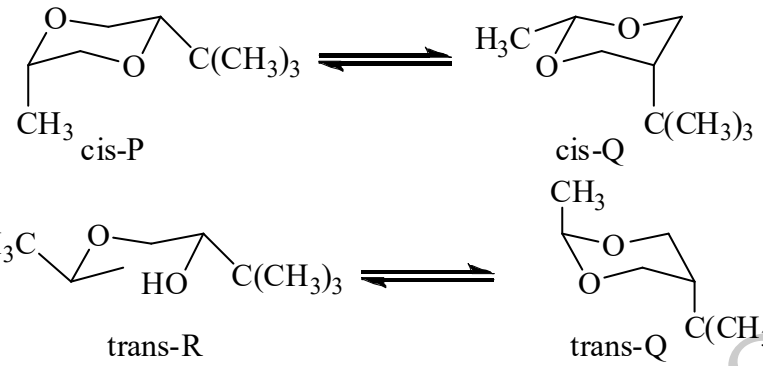
(c) A mixture of enantiomers (d) Only one diastereomers

9. Among the following, the most stable isomer for 3 – methoxycyclohexanol is:

QUANTA CHEMISTRY CLASSES

(a)  (b)  (c)  (d) 

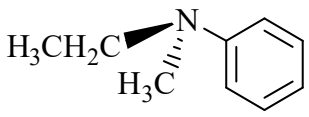
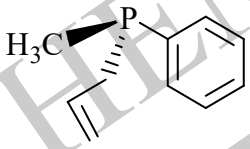
10. Cis – and trans – 2 – methyl – 5 – t – butyl – 1, 3 – dioxane each can exist as two conformers as shown below

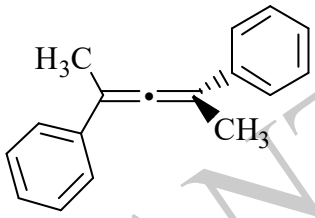
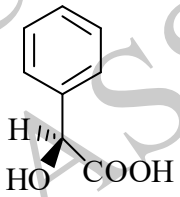


The preferred conformations for the cis – and trans – compounds will be

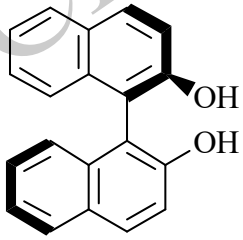
(a) P, R (b) Q, S (c) P, S (d) Q, R

11. Among the following, the optically inactive compound is:

(a)  (b) 

(c)  (d) 

12. The binaphthol (Bnp) is:



(a) An optically active compound with (R) – configuration

(b) An optically inactive compound.

(c) A meso compound

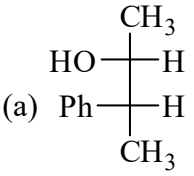
(d) An optically active compound with (S) – configuration.

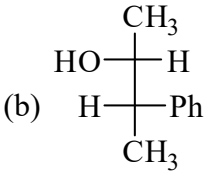
13. Bridge-head hydrogen of the conformer of cis-decalin is positioned as

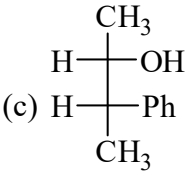
(a) a, a (b) e, e (c) a, e (d) pseudo-a, pseudo-e

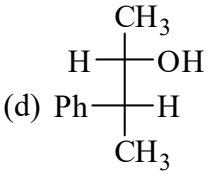
14. The major stereoisomer obtained in the reaction of (S) – 2 – phenylpropanal with MeMgBr is:

QUANTA CHEMISTRY CLASSES

(a) 

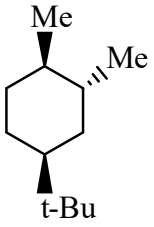
(b) 

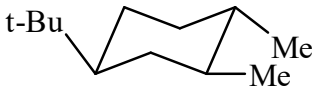
(c) 

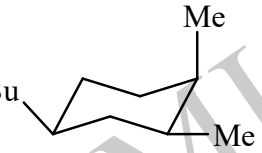
(d) 

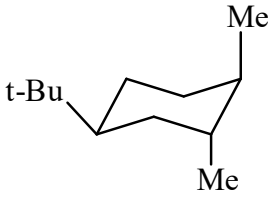
GATE 2006

15. The most stable conformation of the following compound is:



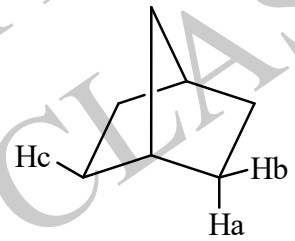
(a) 

(b) 

(c) 

(d)

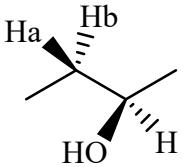
16. Identify the correct stereochemical relationship amongst the hydrogen atoms H_a, H_b and H_c in the following molecule:



(a) H_a and H_b : enantiotopic
(b) H_a and H_b : diastereotopic
(c) H_a and H_c : enantiotopic
(d) H_b and H_c : diastereotopic

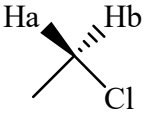
GATE 2007

17. Stereochemical descriptors for the atoms labeled H_a and H_b in the structure.



(X)

(Y)



(Z)

respectively are:

(a) X – homotopic, Y – enantiotopic and Z – diastereotopic

(b) X – enantiotopic, Y – homotopic and Z – diastereotopic

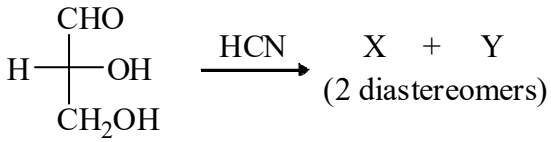
(c) X – diastereotopic, Y – homotopic and Z – enantiotopic

QUANTA CHEMISTRY CLASSES

(d) X – homotopic, Y – diastereotopic and Z – enantiotopic

GATE 2008

18. In the following reaction,



D – Glyceraldehyde

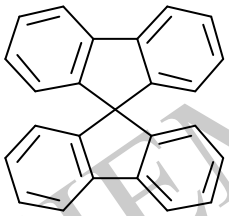
The absolute configurations of the chiral centres in X and Y are

(a) 2S, 3R and 2R, 3R (c) 2R, 3R and 2R, 3S

(c) 2S, 3S and 2R, 3R (d) 2S, 3R and 2S, 3R

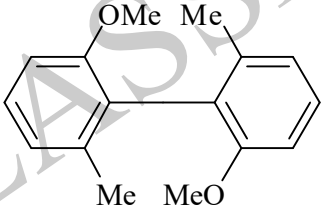
19. Match the entries a – d with their corresponding structures P – S

(A) bridged system (P)

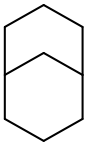


(B) atropisometric system (Q)

(C) spiro system (R)



(D) Fused system (S)

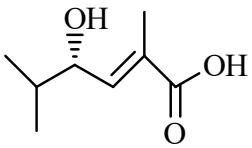


(a) A – S, B – R, C – Q, D – P (b) A – P, B – S, C – Q, D – R

(c) A – Q, B – P, C – S, D – R (d) A – S, B – R, C – P, D – Q

GATE 2009

20. For the compound



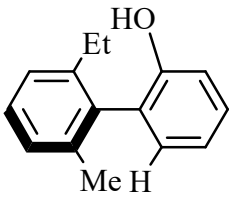
the stereochemical notations are

(a) 2Z, 4R (b) 2Z, 4S (c) 2E, 4R (d) 2E, 4S

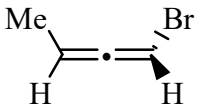
QUANTA CHEMISTRY CLASSES

GATE 2010

21. The absolute configurations for compounds X and Y, respectively are



X

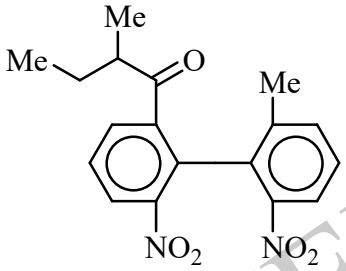


Y

(a) R, S (b) S, R (c) R, R, (d) S, S

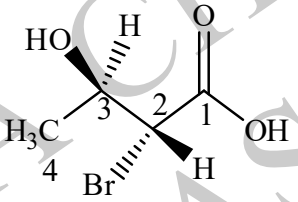
GATE 2013

22. The maximum number of stereoisomers possible for the compound given below is _____



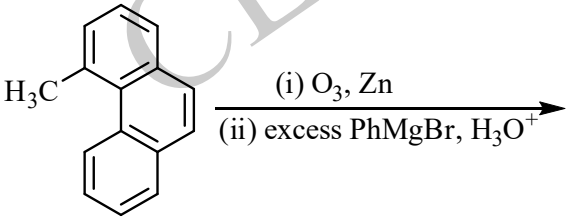
GATE 2015

23. The absolute of C2 and C3 in the following compound is



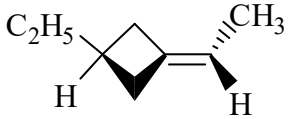
(a) 2R, 3S (b) 2S, 3R (c) 2S, 3S (d) 2R, 3R

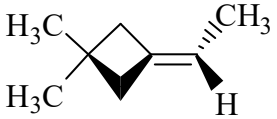
24. The number of possible stereoisomers obtained in the following reaction is _____.

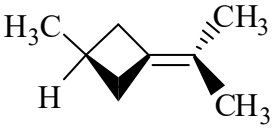


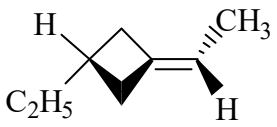
GATE 2016

25. The compound in 'R' configuration is

(a)


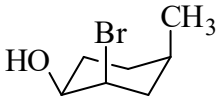
(b)


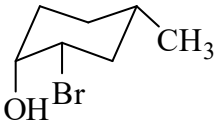
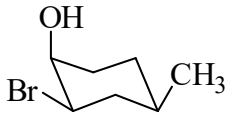
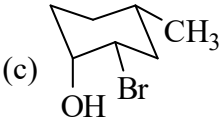
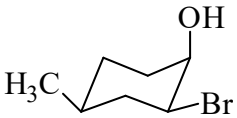
(c)


(d)


26. Ring flipping of the compound in the following conformation leads to

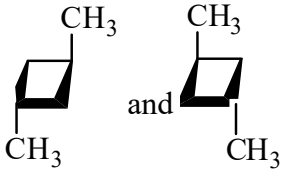
QUANTA CHEMISTRY CLASSES

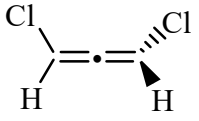
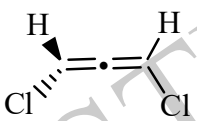


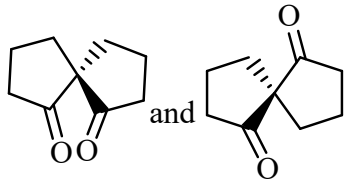
(a)  (b)  (c)  (d) 

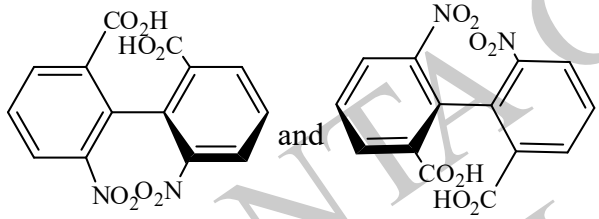
GATE 2018

27. The enantiomeric pair, among the following is

(a) 

(b)  and 

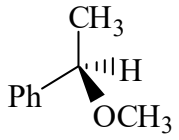
(c) 

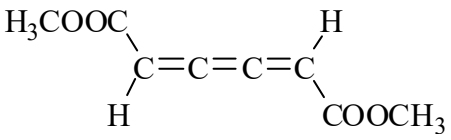
(d) 

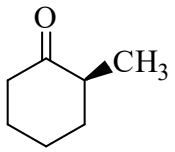
GATE 2019

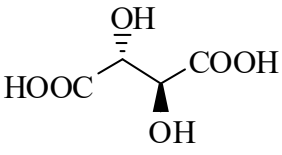
28. The specific rotation of optically pure (R)-2-bromobutane is –112.00. A given sample of 2-bromobutne exhibited a specific rotation of –82.88. The percentage of (S)-(+)-enantiomer present in this sample is _____

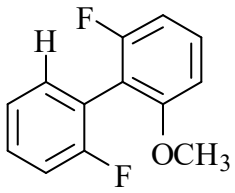
29. Among the following compounds, the number of compounds that DO NOT exhibit optical activity at room temperature is _____.

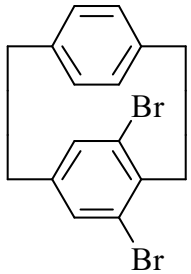








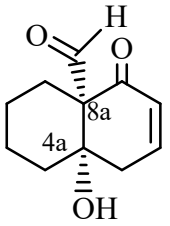




QUANTA CHEMISTRY CLASSES

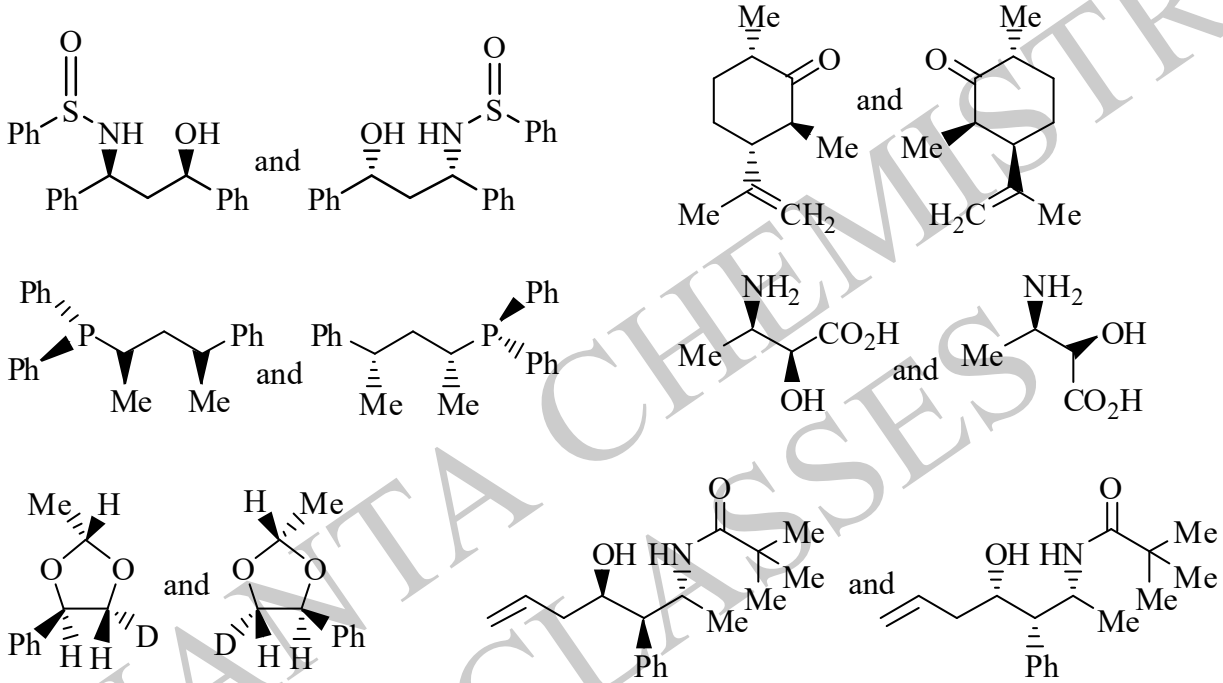
GATE 2020

30. Absolute stereochemistry of the given compound is:



(a) 4a-S, 8a-R (b) 4a-R, 8a-S (c) 4a-S, 8a-S (d) 4a-R, 8a-R

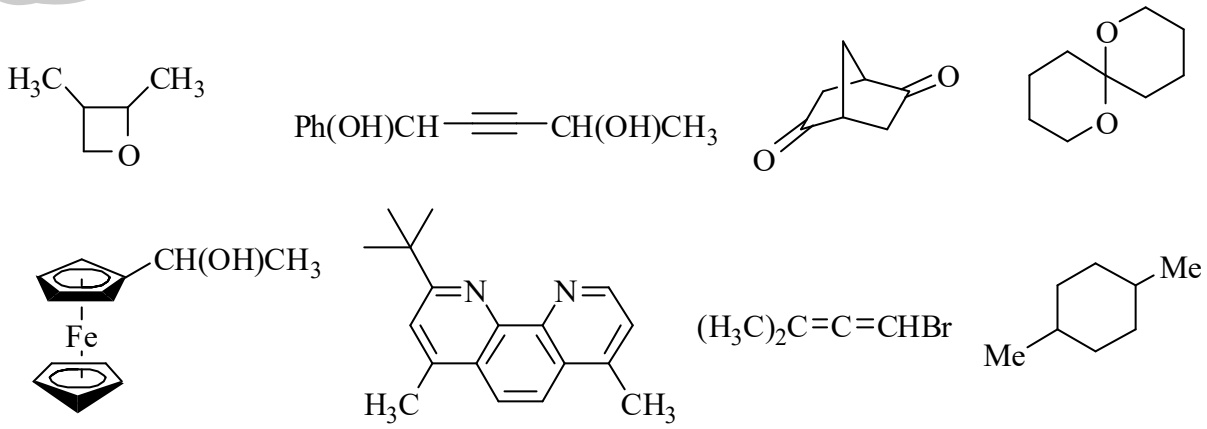
31. Among the following sets,



the total number of set(s) of diastereomeric pair(s) is _____.

GATE 2021

32. Among the following eight compounds,



The number of compound(s) which can exhibit stereoisomerism is_____.

QUANTA CHEMISTRY CLASSES

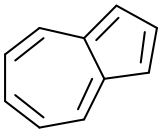
ANSWER KEY

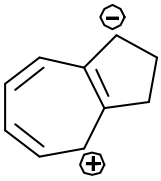
1.	(b)	2.	(a)	3.	(a)	4.	(a)	5.	(b)	6.	(b)	7.	(d)
8.	(b)	9.	(d)	10.	(d)	11.	(a)	12.	(a)	13.	(c)	14.	(c)
15.	(c)	16.	(b)	17.	(c)	18.	(a)	19.	(d)	20.	(d)	21.	(b)
22.	(4)	23.	(d)	24.	(8)	25.	(a)	26.	(b)	27.	(d)	28.	(13)
29.	(4)	30.	(a)	31.	(4)	32.	(6)						

QUANTA CHEMISTRY CLASSES

GATE 2000

1. The following hydrocarbon has a dipole moment of 0.8 D because



(a) It exist as  in which both the rings exhibit aromaticity.

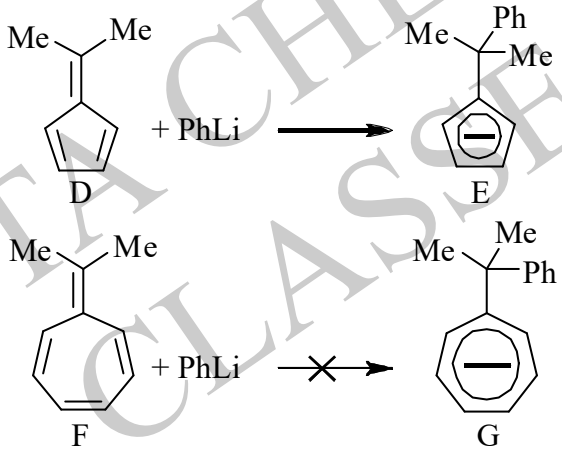
(b) Charge separation permits conformation stability

(c) The two rings are of different size

(d) The molecule obeys 4n + 2 Huckel rule

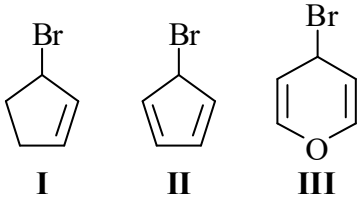
GATE 2001

2. The reaction of dimethyl fulvene D with PhLi readily gives the anion E. However, the analogous compound F does not react with PhLi to give the corresponding anion G. Explain.



GATE 2002

3. Among the bromides I-III given below, the order of their reactivity in the S_N^1 reaction is:

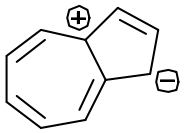
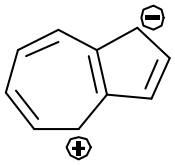


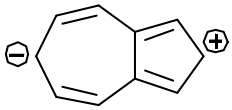
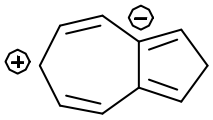
QUANTA CHEMISTRY CLASSES

(a) III > II > I (b) II > III > I (c) III > I > II (d) II > I > III

GATE 2004

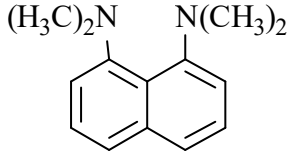
4. Among the resonance forms given below, the one which contributes most to the stability of azulene is

(a)  (b) 

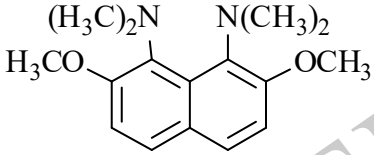
(c)  (d) 

GATE 2007

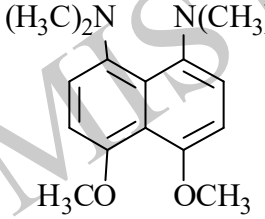
5. The increasing order of basicity among the following is



(X)



(Y)

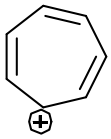
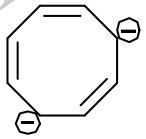


(Z)

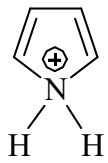
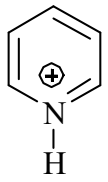
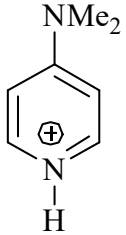
(a) Y < X < Z (b) Y < Z < X (c) X < Z < Y (d) X < Y < Z

GATE 2008

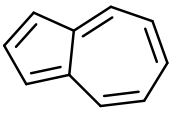
6. The compound that is NOT aromatic is

(a)  (b) (c) (d) 

7. The most acidic species is:

(a) (b)  (c)  (d) 

GATE 2009

8. The compound  is

(a) aromatic and has high dipole moment

(b) aromatic and has no dipole moment

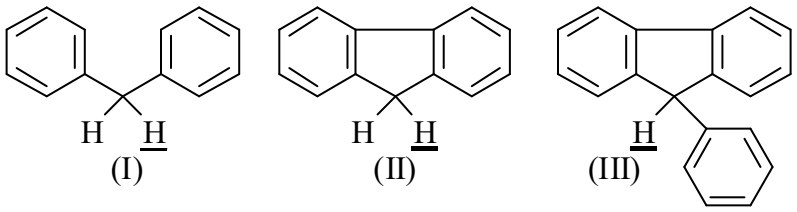
(c) non-aromatic and has high dipole moment

(d) anti-aromatic and has no dipole moment.

QUANTA CHEMISTRY CLASSES

GATE 2010

9. The decreasing order of acidity of marked H of the following molecules is



(a) I > II > III (b) III > I > II (c) III > II > I (d) II > I > III

10. The decreasing order of nucleophilicity for the following anions is

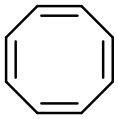
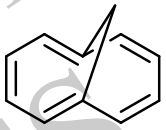
$CH_3CO_2^-, CH_3O^-, C_6H_4O^-, NO_3^-$

(a) $CH_3CO_2^- > CH_3O^- > C_6H_5O^- > NO_3^-$ (b) $CH_3O^- > NO_3^- > C_6H_5O^- > CH_3CO_2^-$

(c) $CH_3O^- > C_6H_5O^- > CH_3CO_2^- > NO_3^-$ (d) $C_6H_5O^- > CH_3O^- > NO_3^- > CH_3CO_2^-$

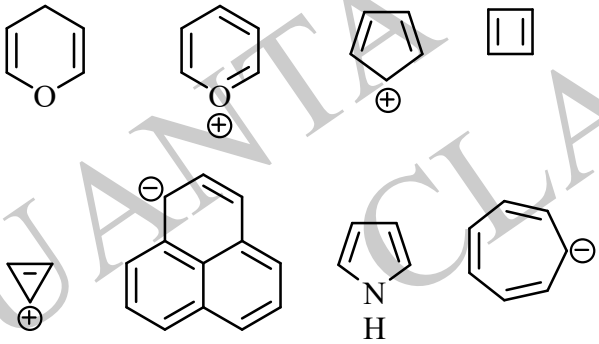
GATE 2015

11. Among the following compounds, the one that is non-aromatic, is

(a)  (b) (c) (d) 

GATE 2020

12. Among the following



the total number of aromatic species is _____

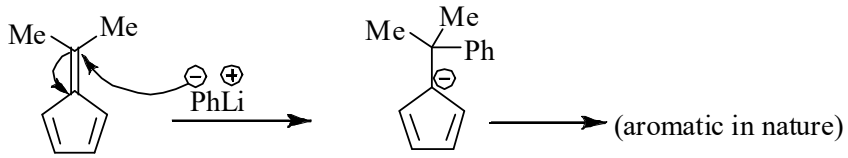
ANSWERS KEY

1.	(a)	2.	(*)	3.	(c)	4.	(b)	5.	(c)	6.	(b)	7.	(b)
8.	(a)	9.	(c)	10.	(c)	11.	(a)						

QUANTA CHEMISTRY CLASSES

HINTS & SOLUTION

2.

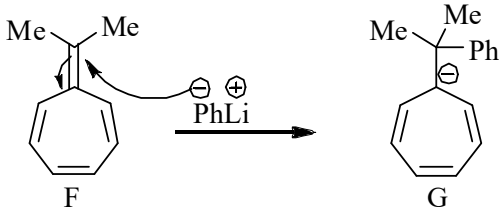


Compound E

Compound (E) follow huckel rule, containing 6π electron system.

After the addition of Ph^- an ion attains aromaticity.

So easly react.

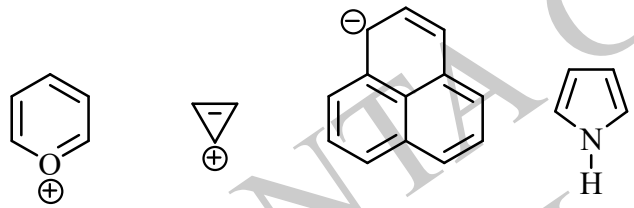


8π electron system (Anti-aromatic)

Compound (F) react with PhLi, form 8π electron system which are not aromatic in nature. Anti-aromatic compound are less stable.

So Ph^- not react with compound (F).

12.



These 4 are aromatic species

QUANTA CHEMISTRY CLASSES

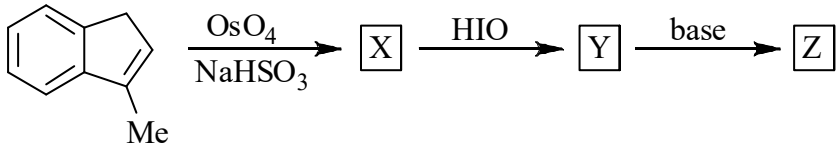
QUANTA CHEMISTRY CLASSES

3

ORGANIC SYNTHESIS & REARRANGEMENTS

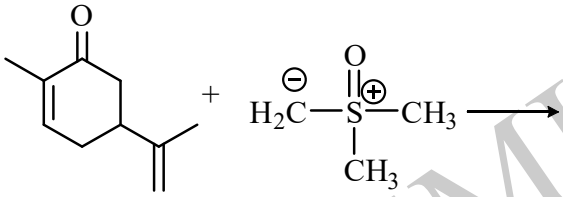
GATE 2002

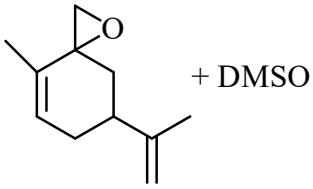
1. Write the structure of the products X, Y and Z in the following sequence of reactions.

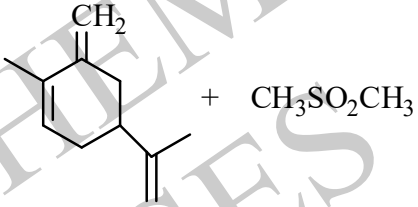


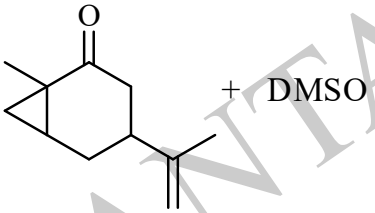
GATE 2003

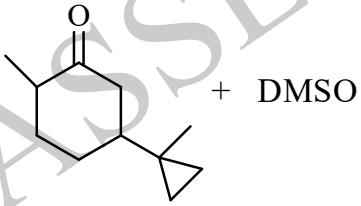
2. The products formed in the following reaction are



(a) 

(b) 

(c) 

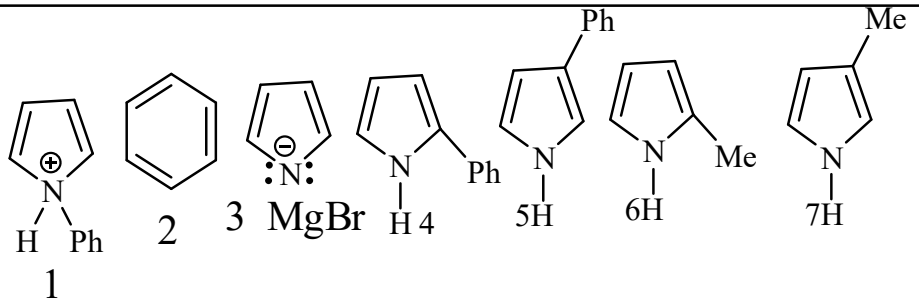
(d) 

3. Pyrrole + PhMgBr $\rightarrow$ E + F

E + MeCl $\rightarrow$ G + H

F + MeCl $\rightarrow$ no reaction without a catalyst.

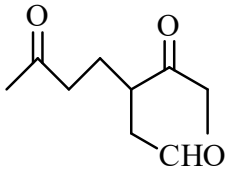
QUANTA CHEMISTRY CLASSES

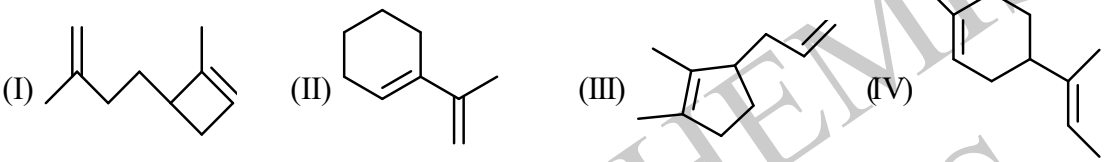


The structure of products E–H, respectively are

(a) 3, 2, 6, 7 (b) 4, 5, 6, 1 (c) 3, 4, 5, 2 (d) 3, 2, 4, 5

4. The reactants that lead to products (X) and (Y) on ozonolysis are

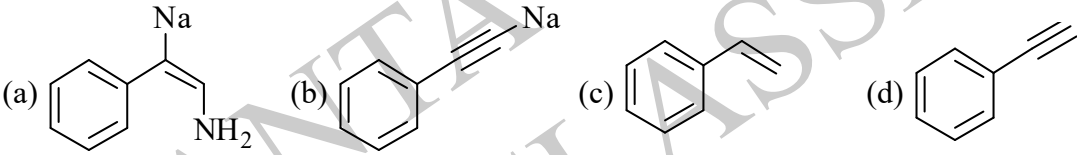




(a) (I) and (IV) (b) (I) and (III) (c) (II) and (III) (d) (II) and (IV)

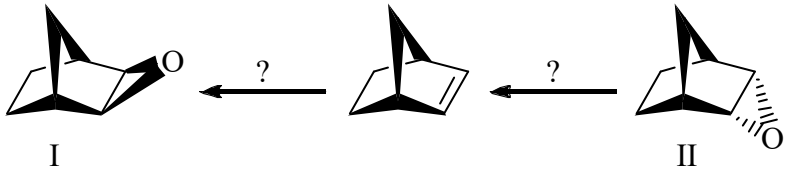
GATE 2004

5. Reaction of phenylacetylene with sodamide in liquid ammonia generates



6. Identify the correct choice of reagents, among P, Q and R, for the transformation of norbornene into the epoxides I and II

P = H_2O_2 – AcOH Q = H_2O_2 – NaOH R = HOBr followed by aq. NaOH.



(a) P gives I and Q gives II (b) R gives I and P gives II

(c) Q gives I and R gives II (d) P gives I and R gives II

7. Reaction of ethyl acetoacetate with one equivalent of methylmagnesium bromide gives

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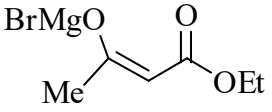
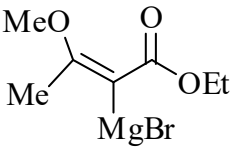
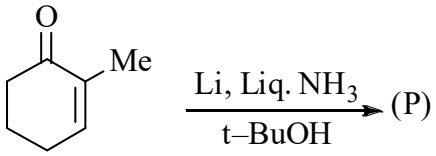
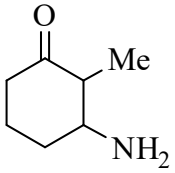
(c) 

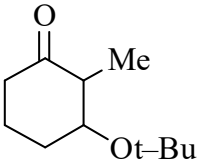
(d) 

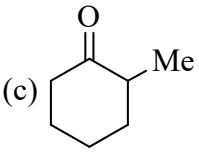
GATE 2005

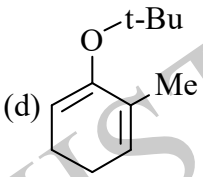
8. The major product P of the following reaction is



(a) 

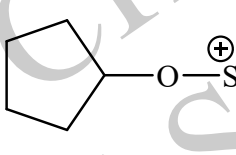
(b) 

(c) 

(d) 

GATE 2006

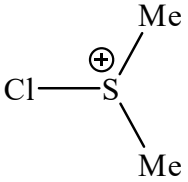
9. Which of the statement is CORRECT about the mechanism of the following reaction?

(a) DMSO react with alcohol initially to give 

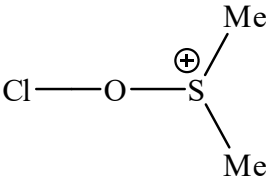
, which reacts with $(COCl)_2$.

(b) $(COCl)_2$ reacts with the alcohol initially to give

, which reacts with DMSO

(c) DMSO reacts with $(COCl)_2$ initially to give 

, which reacts with the alcohol.

(d) $(COCl)_2$ react with DMSO initially to give 

which reacts with the alcohol.

10. The prodcuts P and Q in the following sequence of reactions, respectively, are

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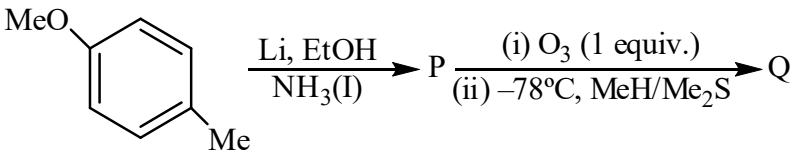
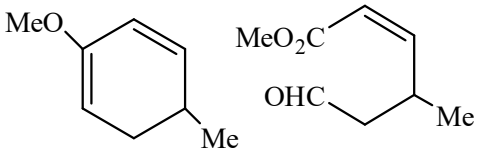
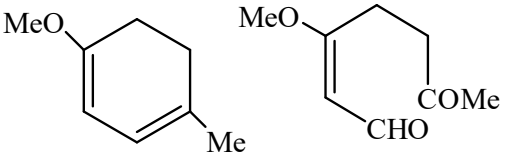
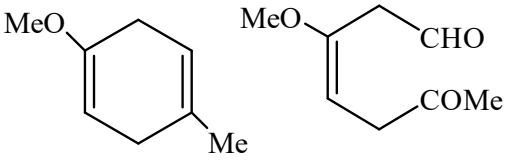
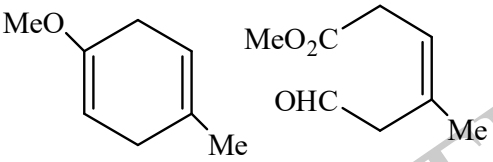


(a) 

(b) 

(c) 

(d) 

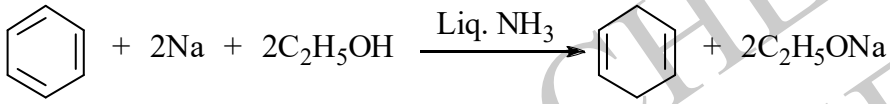
11. The reagent for selective reduction of the aldehyde group in Q obtained in the above reaction is

(a) $H_2, (Ph_3P)_3\ RhCl$ (b) $((H_3C)_2\ CHCH_2)_2\ AlH$

(c) $Na(CH_3COO)_3\ BH$ (d) $LiAlH_4$

GATE 2007

12. The reaction,

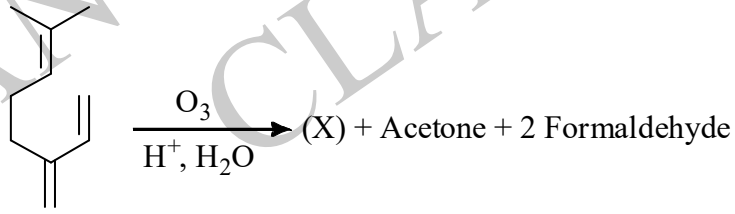


is an example of a

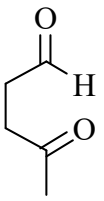
(a) Birch reduction (b) Clemmenson reduction

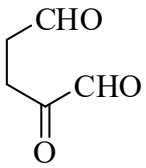
(c) Wolff – Kishner reduction (d) hydride reduction

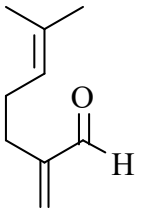
13. In the reaction,

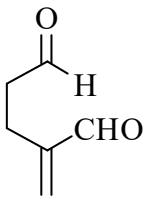


Compound X is

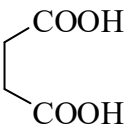
(a) 

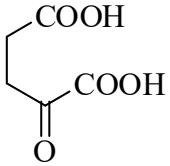
(b) 

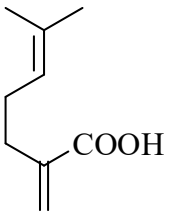
(c) 

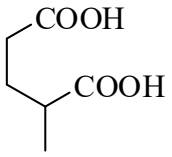
(d) 

14. Oxidation of X with chromic acid chiefly gives

(a) 

(b) 

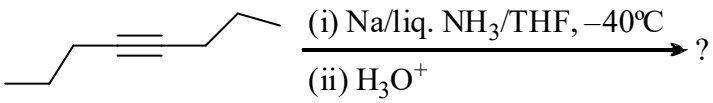
(c) 

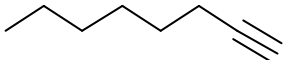
(d) 

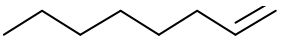
QUANTA CHEMISTRY CLASSES

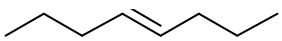
GATE 2008

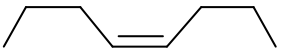
15. The major proeduct of the following reaction is



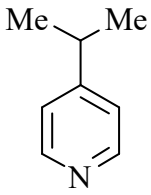
(a) 

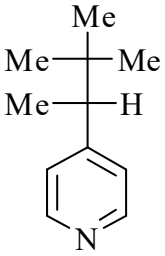
(b) 

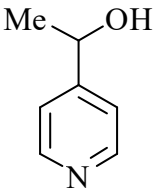
(c) 

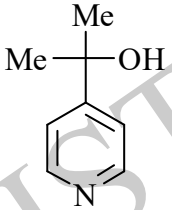
(d) 

16. The compound that is NOT oxidized by $KMnO_4$ is:

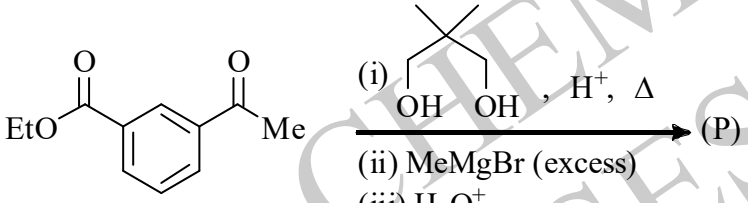
(a) 

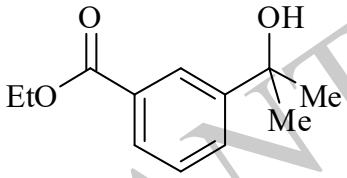
(b) 

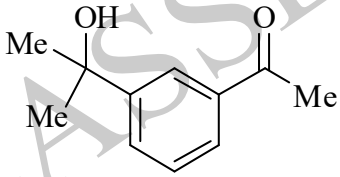
(c) 

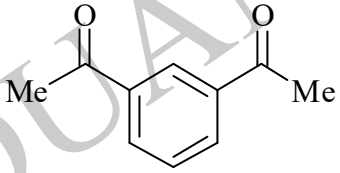
(d) 

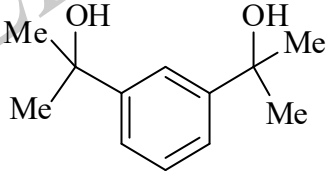
17. The major product P of the following reactions is



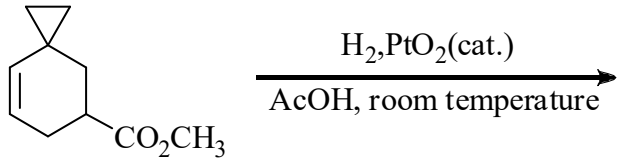
(a) 

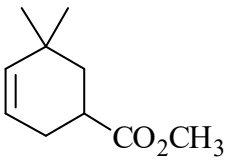
(b) 

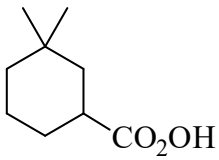
(c) 

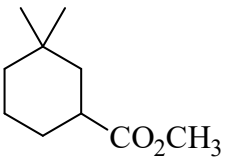
(d) 

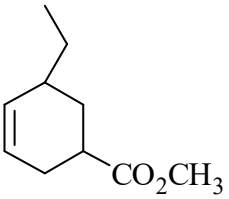
18. The major product of the following reaction is:



(a) 

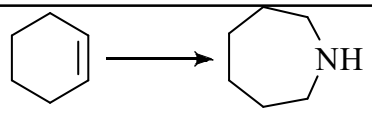
(b) 

(c) 

(d) 

19. The most appropriate sequence of reactions for carrying out the following transformation.

QUANTA CHEMISTRY CLASSES



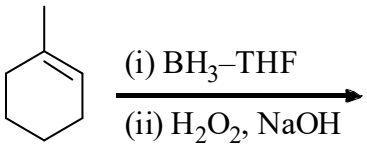
(a) (i) O_3/H_2O_2; (ii) excess $SOCl_2$/pyridine; (iii) excess NH_3; (iv) $LiAlH_4$

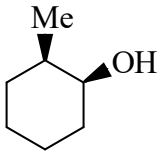
(b) (i) O_3/Me_2S; (ii) excess $SOCl_2$/pyridine; (iii) $LiAlH_4$; (iv) excess NH_3

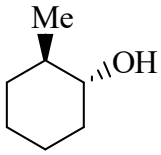
(c) (i) O_3/H_2O_2; (ii) excess $SOCl_2$/pyridine; (iii) $LiAlH_4$; (iv) excess NH_3

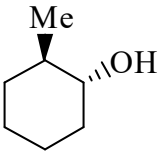
(d) (i) O_3/Me_2S; (ii) excess $SOCl_2$/pyridine; (iii) excess NH_3; (iv) $LiAlH_4$

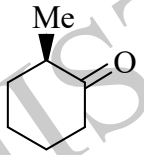
20. The major product of the following reaction is



(a) 

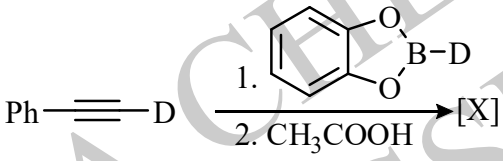
(b) 

(c) 

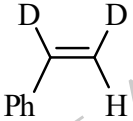
(d) 

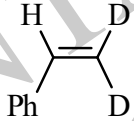
GATE 2009

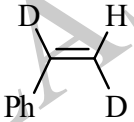
21. In the reaction

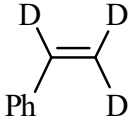


the major product X is

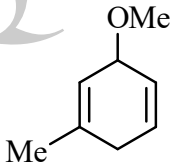
(a) 

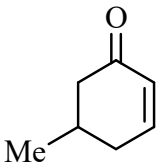
(b) 

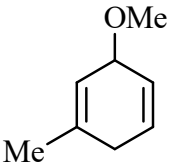
(c) 

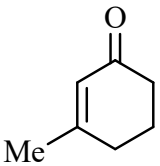
(d) 

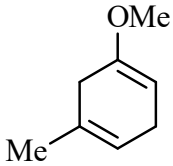
22. Reaction of m-menthylanisole with lithium in liquid ammonia and t-butyl alcohol at –33°C generates compound X as the major product. Treatment of the compound X with dilute sulphuric acid produces compound Y as the major product. The compounds X and Y, respectively, are

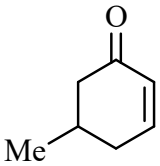
(a) 

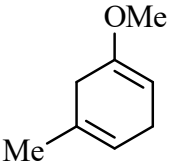
and 

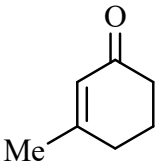
(b) 

and 

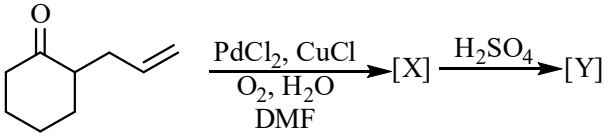
(c) 

and 

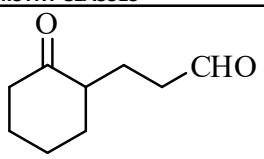
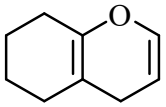
(d) 

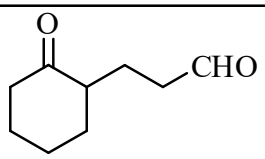
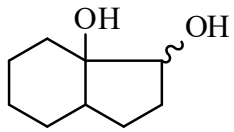
and 

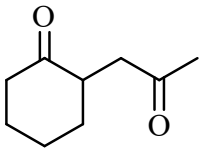
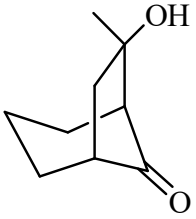
23. In the reaction sequence the major products X and Y, respectively are

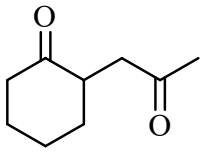
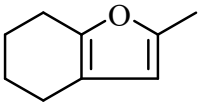


QUANTA CHEMISTRY CLASSES

(a)  and 

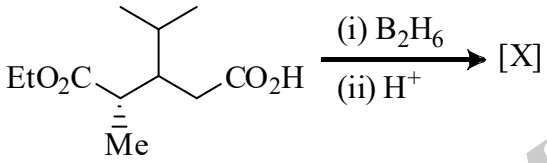
(b)  and 

(c)  and 

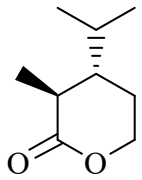
(d)  and 

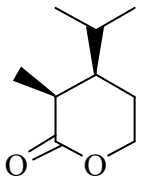
GATE 2010

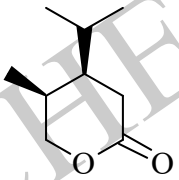
24. In the reaction

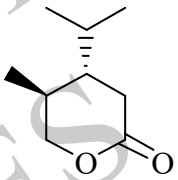


the major product [X] is:

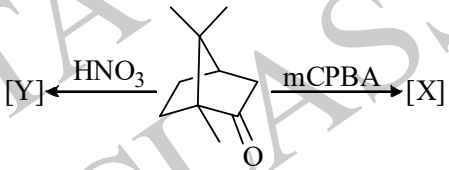
(a) 

(b) 

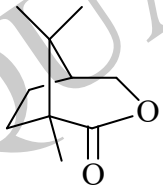
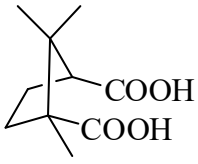
(c) 

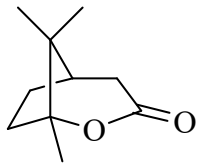
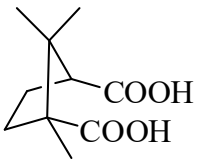
(d) 

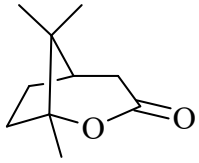
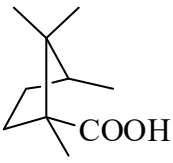
25. In the reaction,

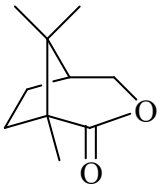
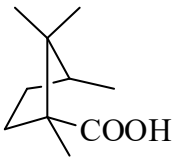


the major products, [X] and [Y], respectively, are

(a)  and 

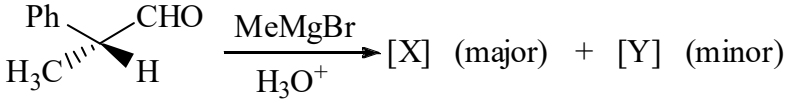
(b)  and 

(c)  and 

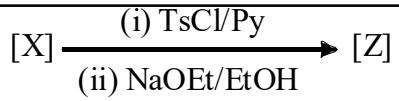
(d)  and 

Linked Answer Q. 26 and Q. 27:

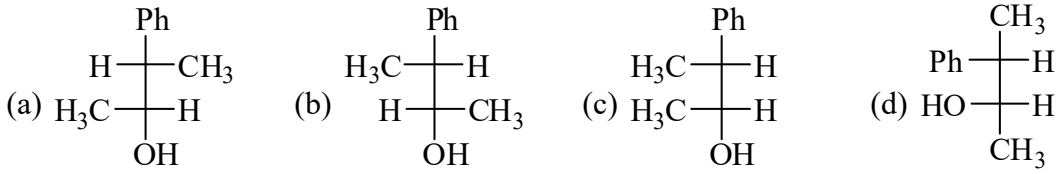
In the reaction sequence



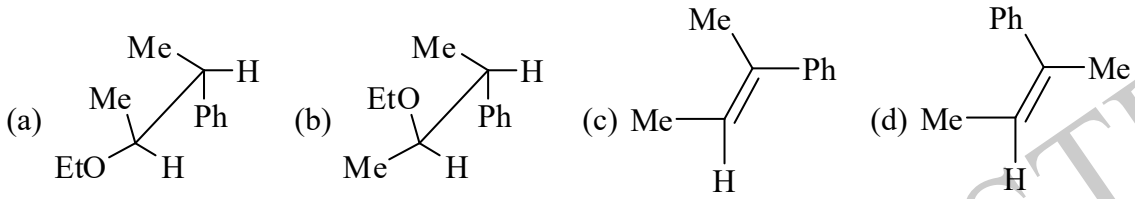
QUANTA CHEMISTRY CLASSES



26. The compound [X] is:

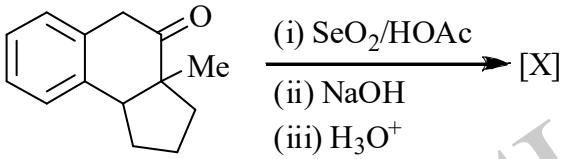


27. The compound [Z] is:

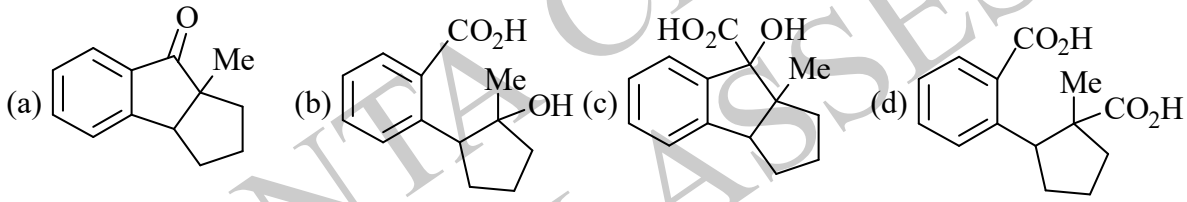


GATE 2011

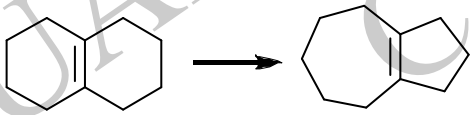
28. In the following reaction,



the major product [X] is:



29. The mosjt appropriate sequence of reactions for carrying out the following conversion



is

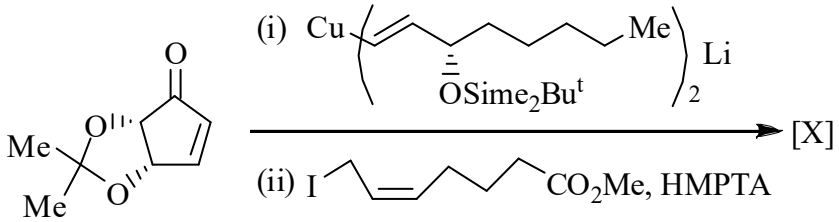
(a) (i) Peracid; (ii) H^+; (iii) Zn/dil. HCl

(b) (i) Alkaline $KMnO_4$; (ii) $NaIO_4$; (iii) N_2H_4/KOH

(c) (i) Alkaline $KMnO_4$; (ii) H^+; (iii) Zn/dil. HCl

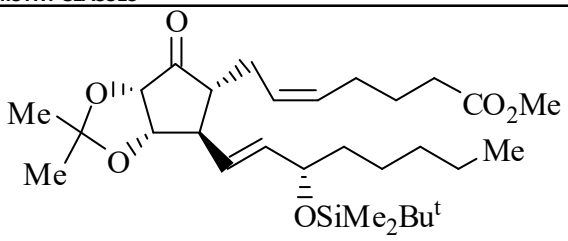
(d) (i) O_3/Me_2S; (ii) NaOEt; (iii) N_2H_4/KOH

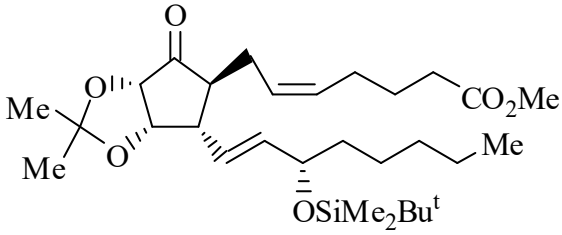
30. In the following conversion

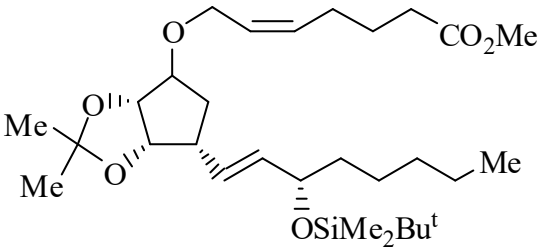


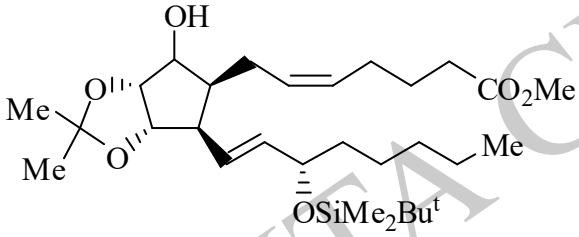
the major product [X] is:

QUANTA CHEMISTRY CLASSES

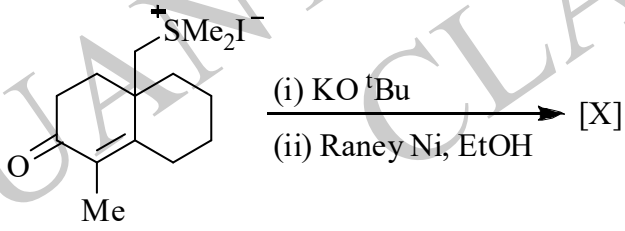
(a) 

(b) 

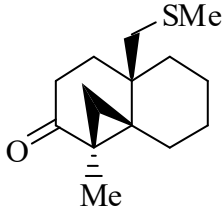
(c) 

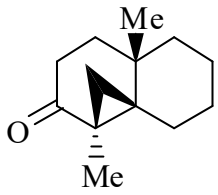
(d) 

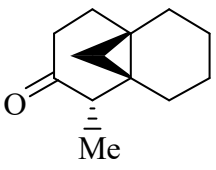
31. In the following reaction,

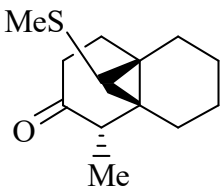


the major product [X] is:

(a) 

(b) 

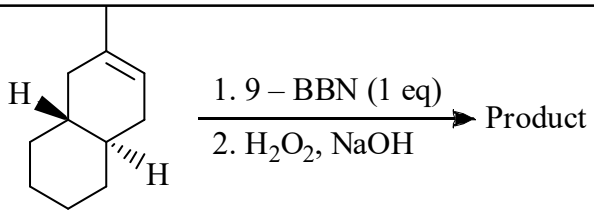
(c) 

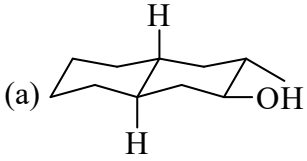
(d) 

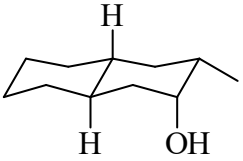
GATE 2012

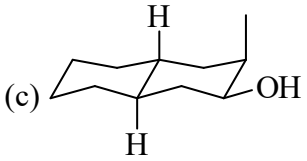
32. Identify the product from the following reaction

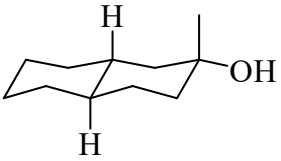
QUANTA CHEMISTRY CLASSES



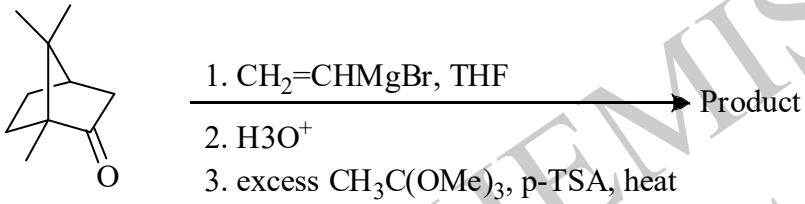
(a) 

(b) 

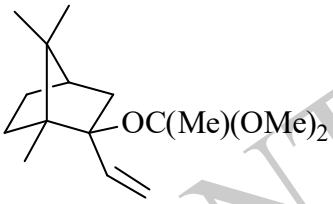
(c) 

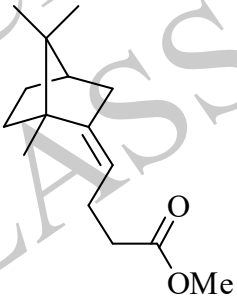
(d) 

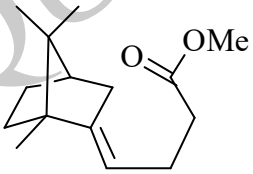
33. In the reaction given below, identify the product

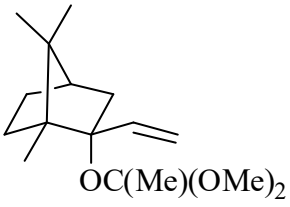


(p – TSA = p – toluenesulfonic acid; THF = tetrahydrofuran)

(a) 

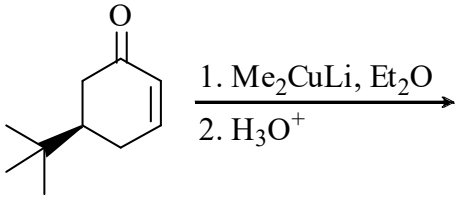
(b) 

(c) 

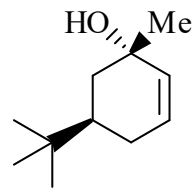
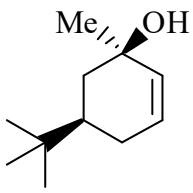
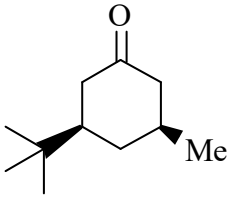
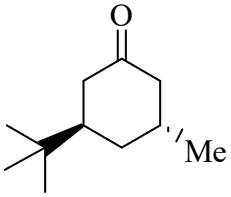
(d) 

GATE 2013

34. The major product formed in the reaction given below is:

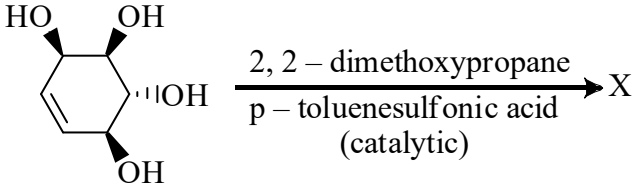


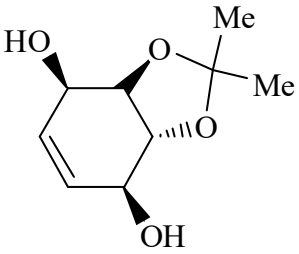
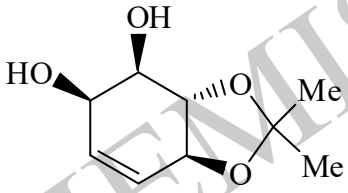
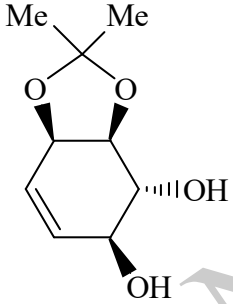
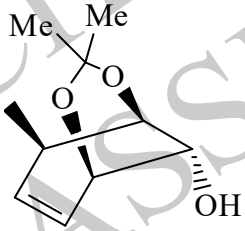
QUANTA CHEMISTRY CLASSES

(a) 
(b) 
(c) 
(d) 

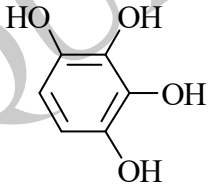
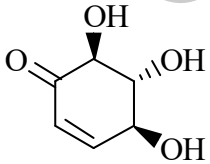
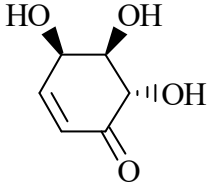
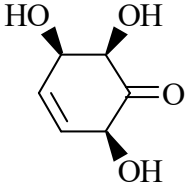
Linked Answer Q. 35 and Q. 36:

35. The major product X formed in the reaction given below is



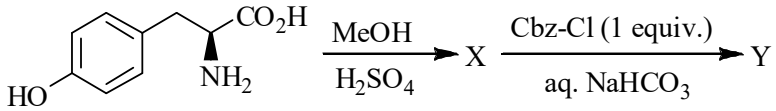
(a) 
(b) 
(c) 
(d) 

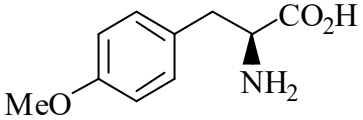
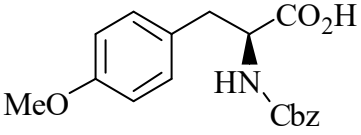
36. Oxidation of the product X, obtained in the above reaction, with active manganse dioxide, followed by acidic hydrolysis gives

(a) 
(b) 
(c) 
(d) 

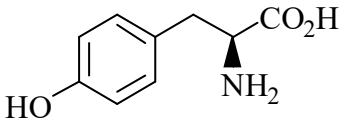
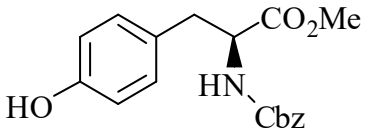
GATE 2014

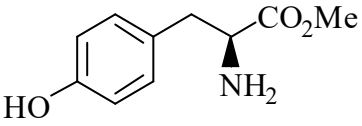
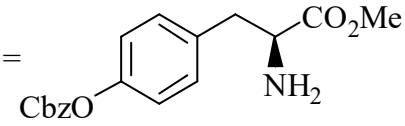
37. The major products X and Y formed in the following reaction sequence are

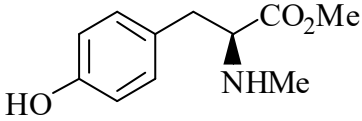
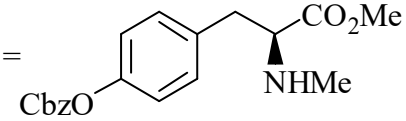


(a) X = 
Y = 

QUANTA CHEMISTRY CLASSES

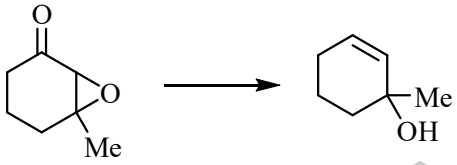
(b) X =  Y = 

(c) X =  Y = 

(d) X =  Y = 

GATE 2015

38. The most suitable reagent (s) to effect the following transformed is

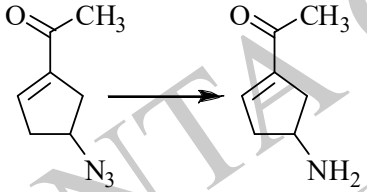


(a) N_2H_4, KOH heat (b) $TsNHNH_2$, CF_3 COOH

(c) $LiAlH_4$ (d) Na, liq. NH_3

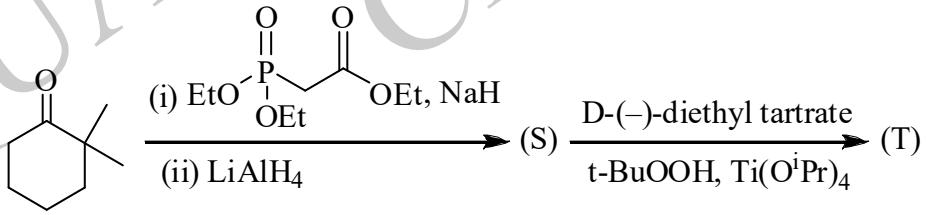
GATE 2016

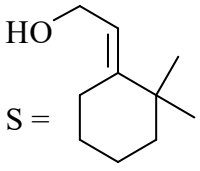
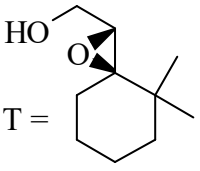
39. The most suitable reagent for performing the following transformation, is

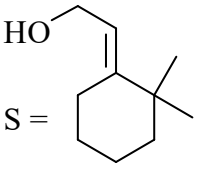
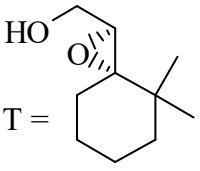


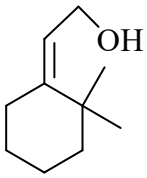
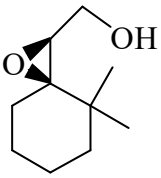
(a) $LiAlH_4$ (b) H_2, Pd/C (c) PPh_3, H_2O (d) Li, Liq. NH_3

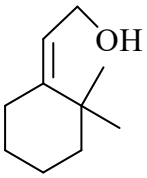
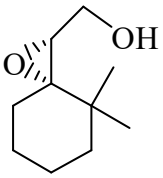
40. The major product S and T formed in the following synthetic schemem, are



(a) S =  T = 

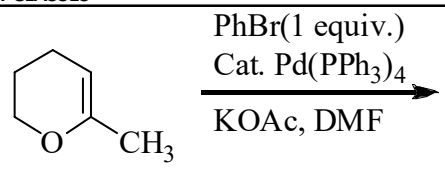
(b) S =  T = 

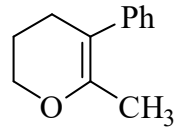
(c) S =  T = 

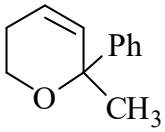
(d) S =  T = 

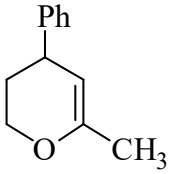
41. The major product formed in the following reaction, is

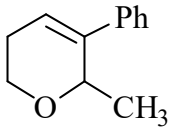
QUANTA CHEMISTRY CLASSES



(a) 

(b) 

(c) 

(d) 

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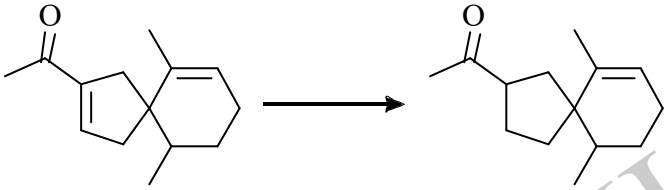
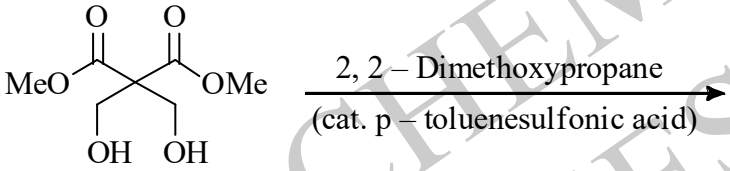
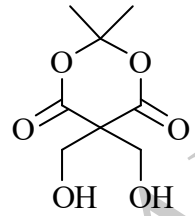
42. The most suitable reagenet for the following transformation is

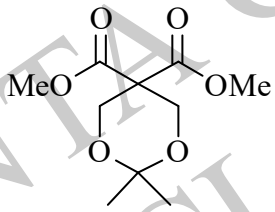


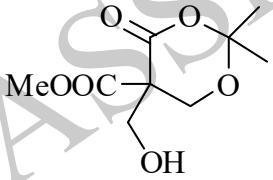
(a) $Li / Liq. NH_3$ (b) PtO_2 / H_2 (c) $LiAlH_4$ (d) B_2H_6

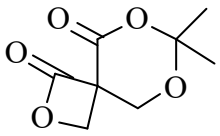
43. The major product obtained in the following reaction is



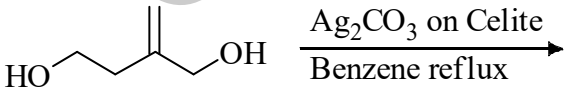
(a) 

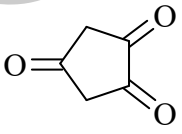
(b) 

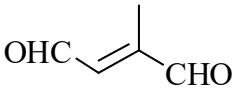
(c) 

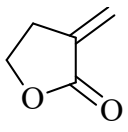
(d) 

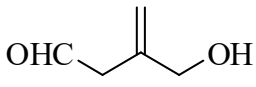
44. The major product formed in the following reaction is



(a) 

(b) 

(c) 

(d) 

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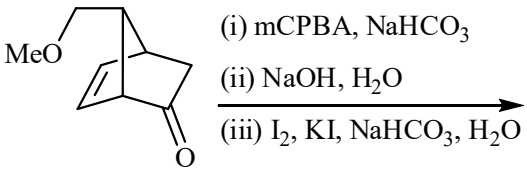
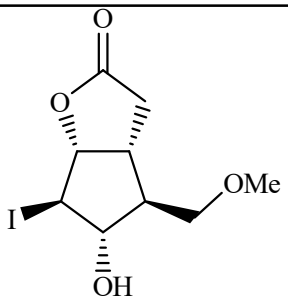
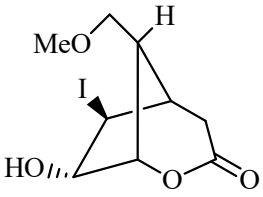
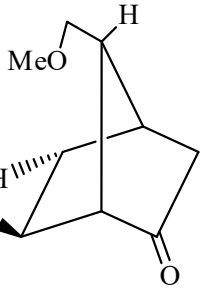
45. The major product in the following reaction sequence is

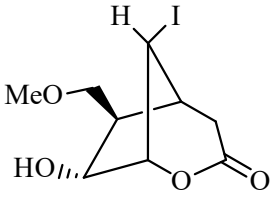


QUANTA CHEMISTRY CLASSES

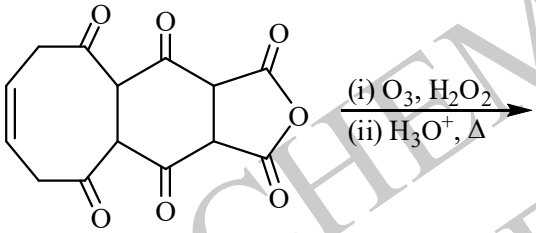
(a) 

(b) 

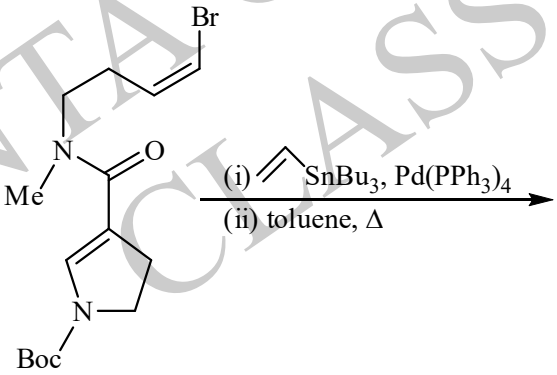
(c) 

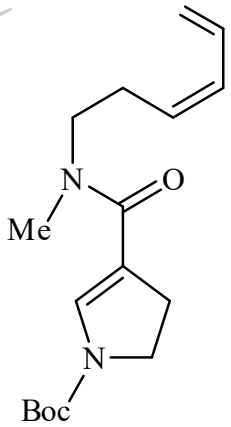
(d) 

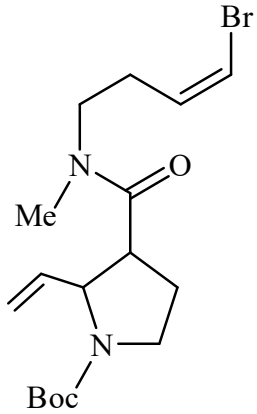
46. Number of carbonyl groups present in the final product of the following reaction sequence is



47. The major product of the following reaction sequence is



(a) 

(b) 

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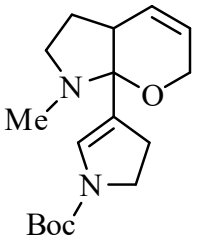
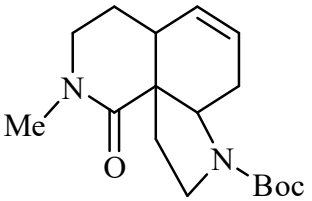
(c) 

(d) 

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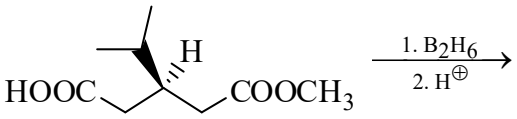
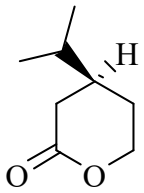
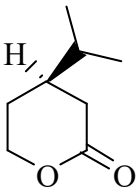
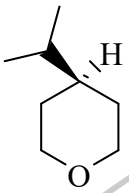
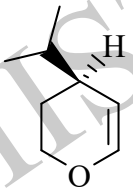
48. The major product formed in the following reaction is



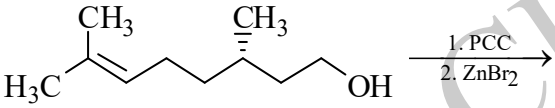
(a) 

(b) 

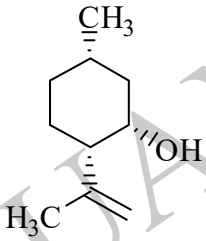
(c) 

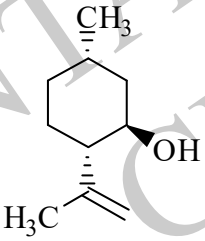
(d) 

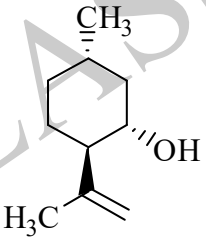
49. The major product formed in the following reaction is

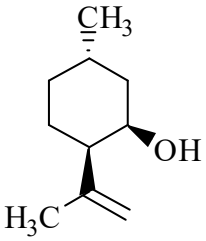


(PCC = pyridinium chlorochromate)

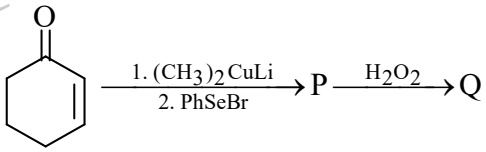
(a) 

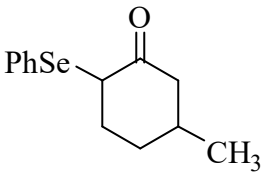
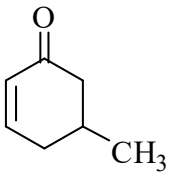
(b) 

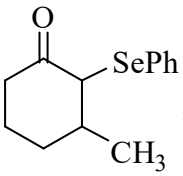
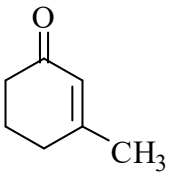
(c) 

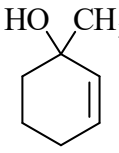
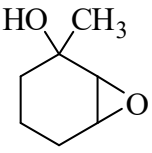
(d) 

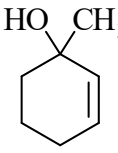
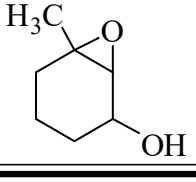
50. In the following reaction sequence, the products P and Q are



(a) P =  ; Q = 

(b) P =  ; Q = 

(c) P =  ; Q = 

(d) P =  ; Q = 

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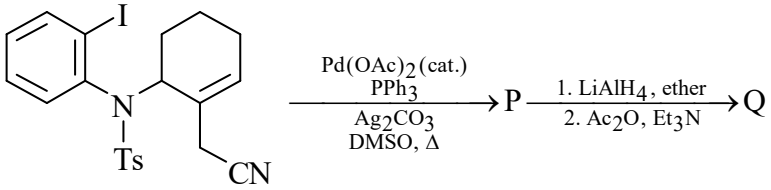
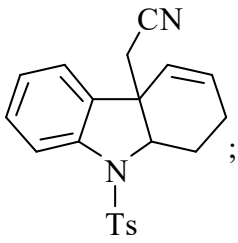
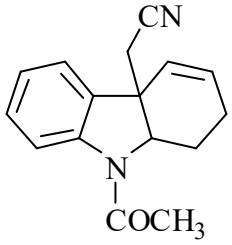
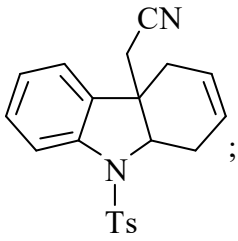
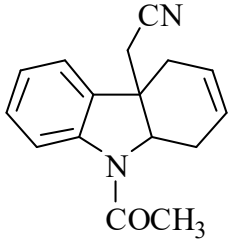
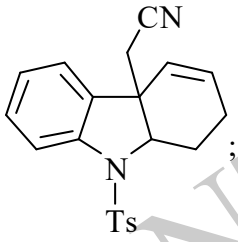
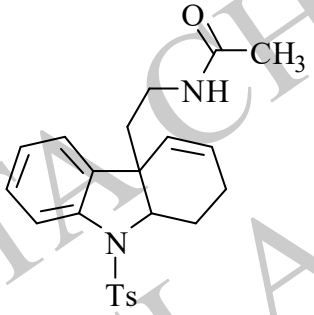
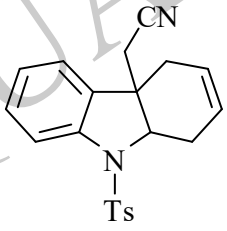
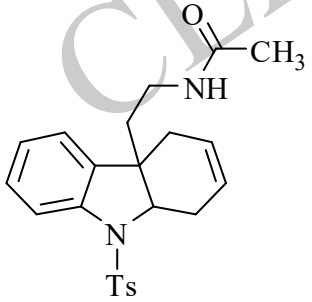
51. In the following reaction sequence, the products P and Q are



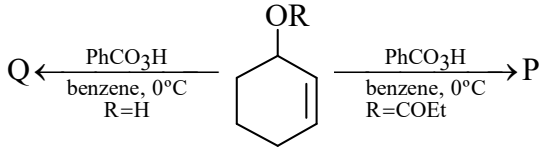
(a) P =  ; Q = 

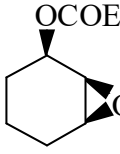
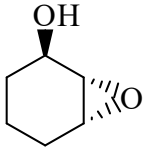
(b) P =  ; Q = 

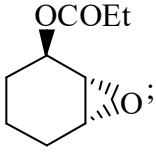
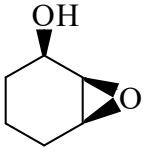
(c) P =  ; Q = 

(d) P =  ; Q = 

52. In the following reactions, the major products P and Q are



(a) P =  ; Q = 

(b) P =  ; Q = 

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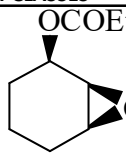
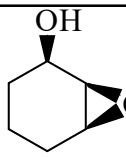
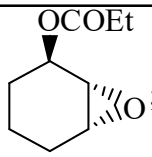
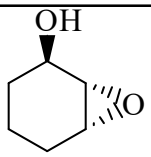
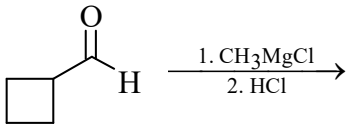
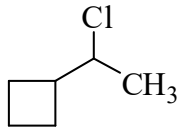
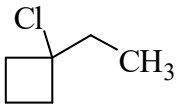
(c) P =  ; Q = 

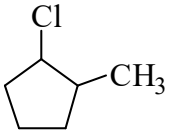
(d) P =  ; Q = 

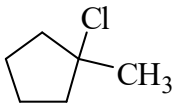
53. The major product formed in the following reaction is



(a) 

(b) 

(c) 

(d) 

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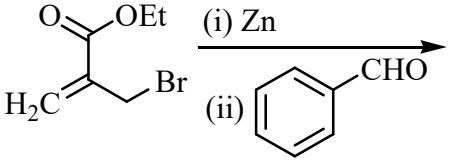
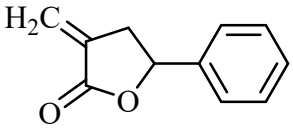
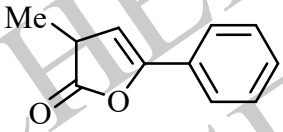
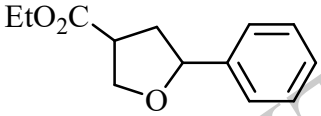
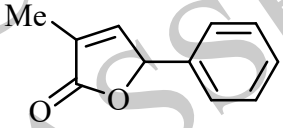
54. Major product formed in the following transformation is



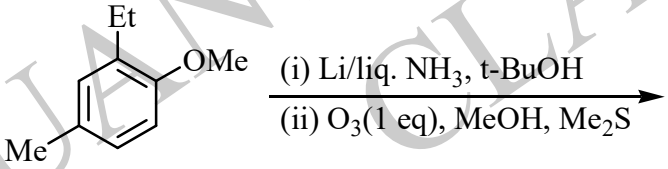
(a) 

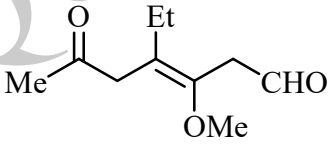
(b) 

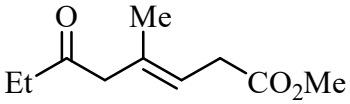
(c) 

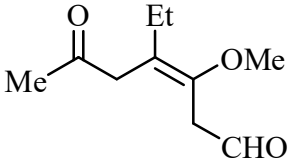
(d) 

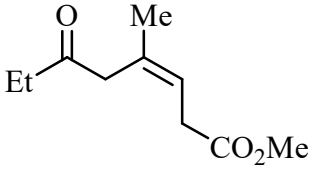
55. Major product formed in the following reaction sequence is:



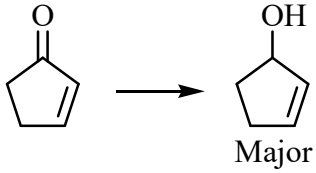
(a) 

(b) 

(c) 

(d) 

56. Among the following, the suitable reagents for the given transformation is:



(a) $NaBH_4/CeCl_3 \cdot 7H_2O$

(b) $H_2N–NH_2/KOH, \Delta$

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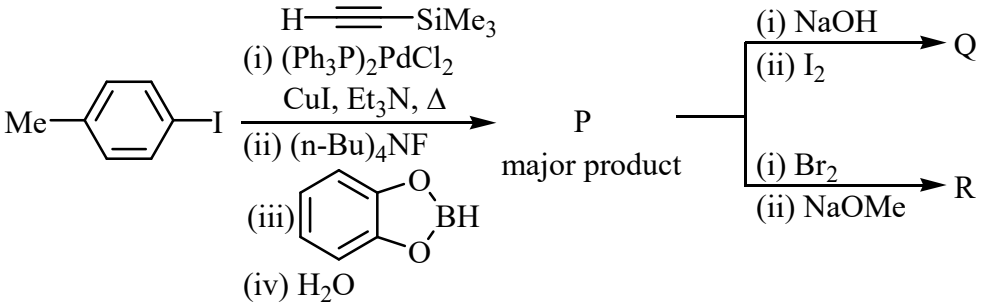
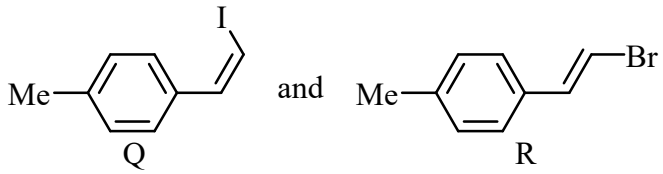
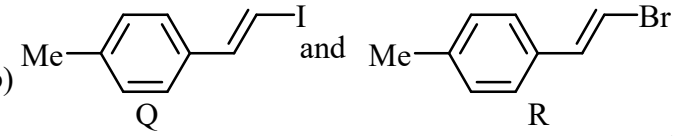
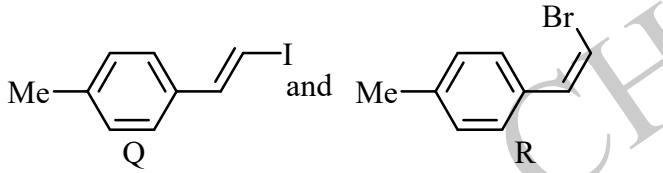
(c) Li/Liq. NH_3 (d) H_2, Pd/C

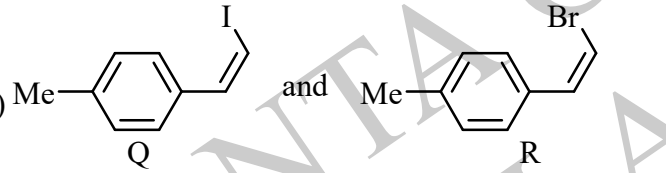
57. In the following reaction sequence, the major products Q and R are:



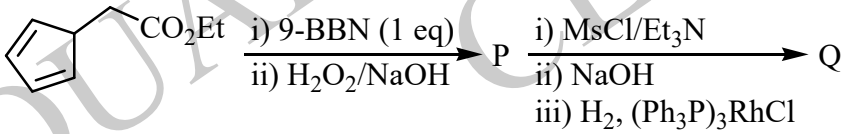
(a) 

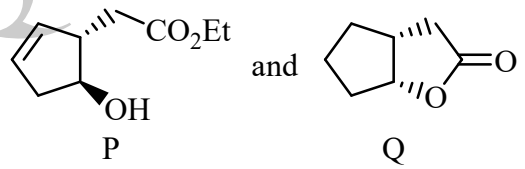
(b) 

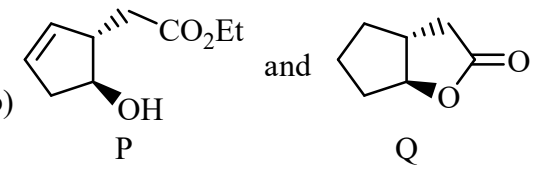
(c) 

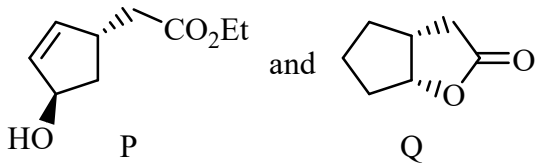
(d) 

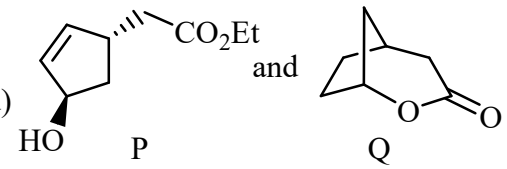
58. Major products P and Q, in the given reaction sequence, are:



(a) 

(b) 

(c) 

(d) 

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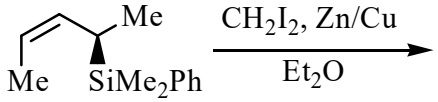
59. The major product formed in the following reaction



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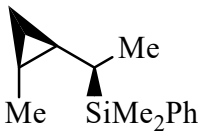
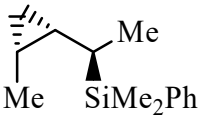
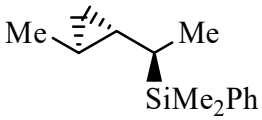
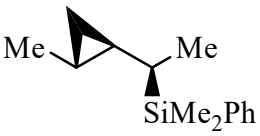
is:

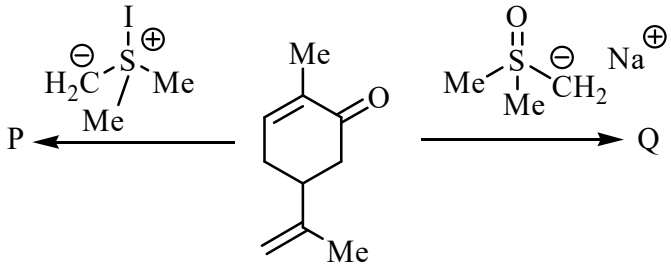
(a) 

(b) 

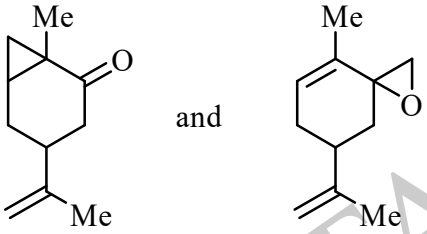
(c) 

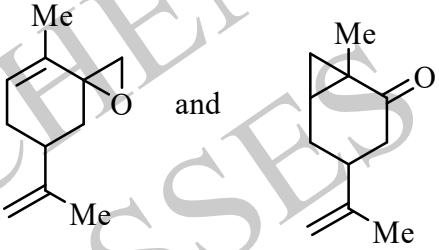
(d) 

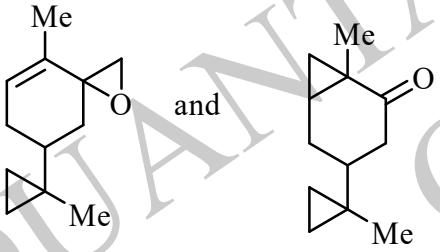
60. The major product P and Q formed in the following reactions

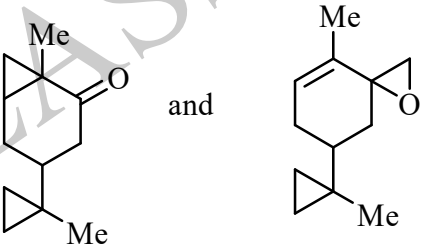


respectively, are:

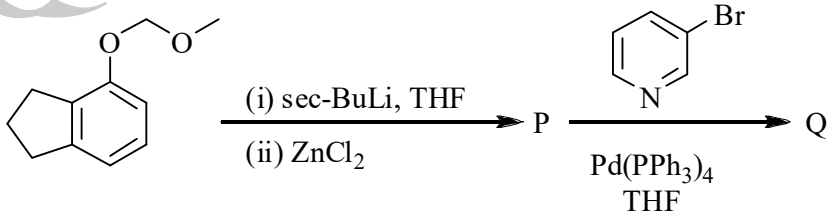
(a) 

(b) 

(c) 

(d) 

61. In the following reaction sequence



the major products P and Q, respectively, are:

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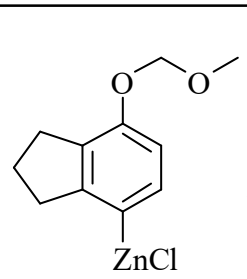
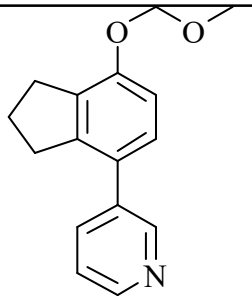
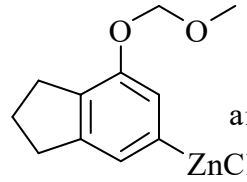
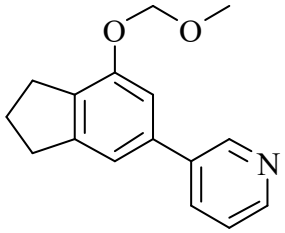
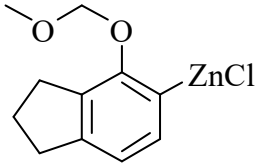
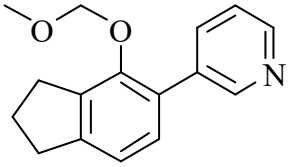
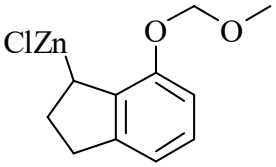
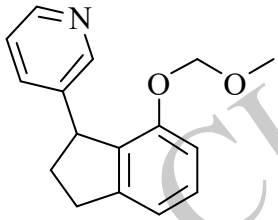
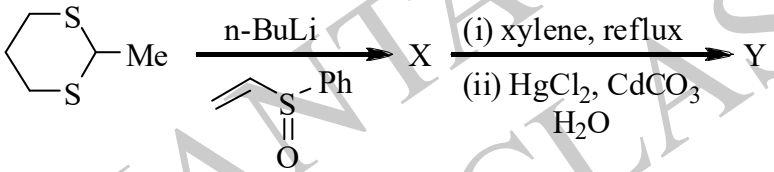
(a)  and 

(b)  and 

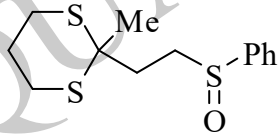
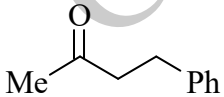
(c)  and 

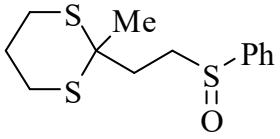
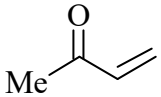
(d)  and 

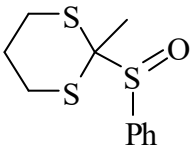
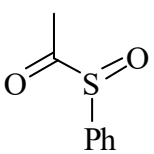
62. In the following reaction

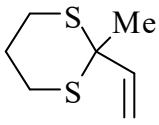
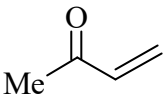


the major products X and Y, respectively, are:

(a)  and 

(b)  and 

(c)  and 

(d)  and 

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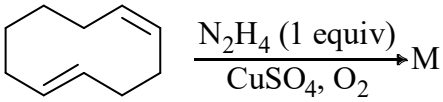
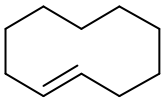
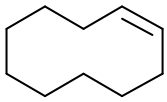
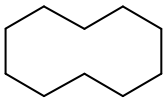
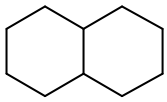
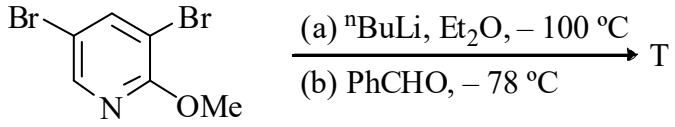
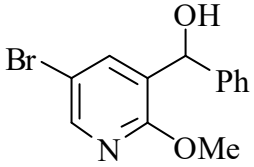
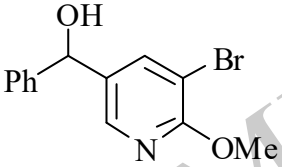
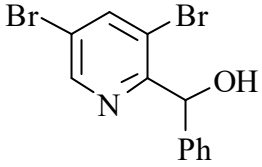
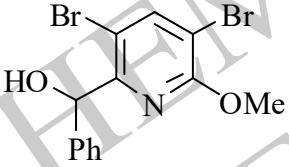
63. The major product M formed in the following reaction is



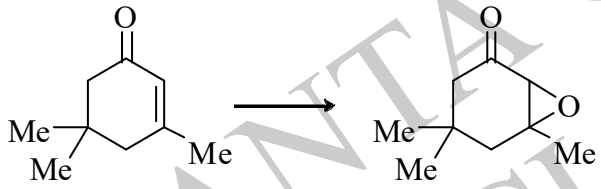
(a) 
(b) 
(c) 
(d) 

64. The major product T formed in the following reaction is



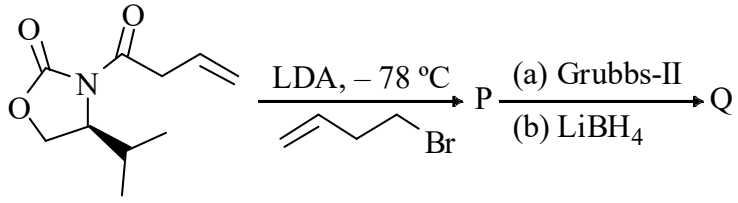
(a) 
(b) 
(c) 
(d) 

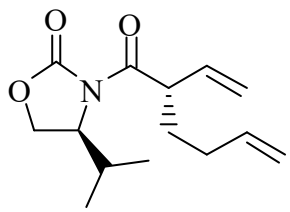
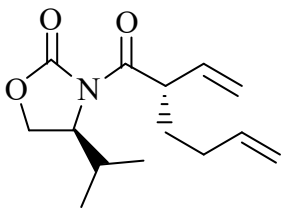
65. The CORRECT reagent(s) for the given reaction is(are)



(a) H_2O_2, NaOH
(b)
(c) DIBAL-H, then mCPBA
(d) SO_3-pyridine, Me_2SO

66. The major products P and Q in the following reaction sequence are



(a) P =  Q =
(b) P =  Q =

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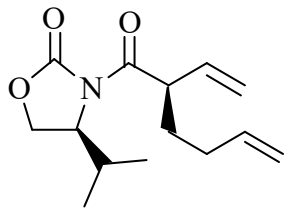
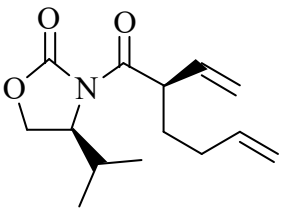
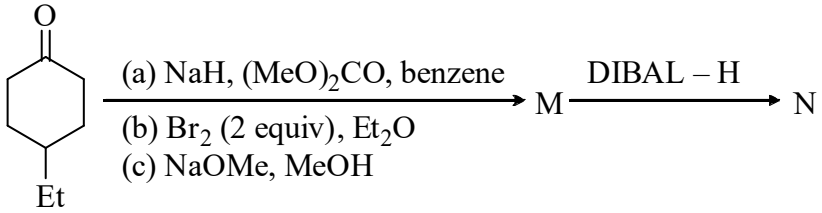
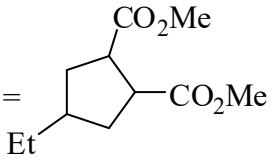
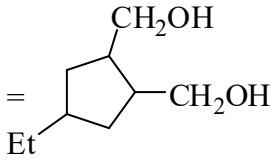
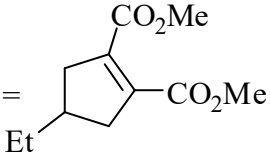
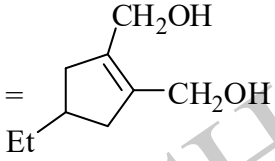
(c) P =  Q =

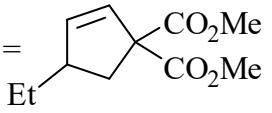
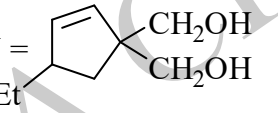
(d) P =  Q =

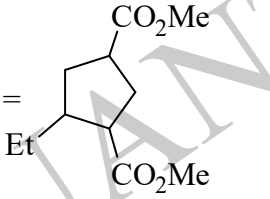
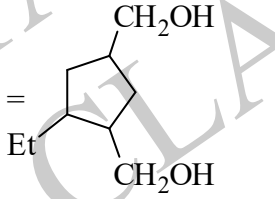
67. The major products M and N in the given reaction sequence are



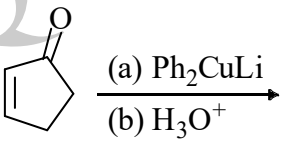
(a) M =  N = 

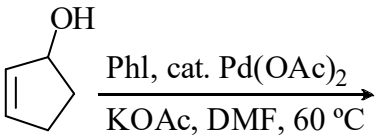
(b) M =  N = 

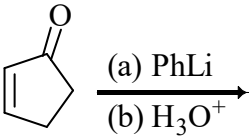
(c) M =  N = 

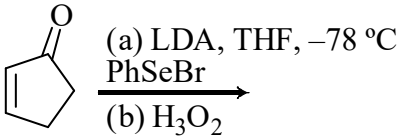
(d) M =  N = 

68. The reaction(s) that yield(s) 3-phenylcyclopentanone as the major product is(are)

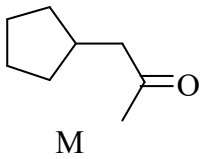
(a) 

(b) 

(c) 

(d) 

69. The reaction(s) that yield(s) M as the major product is(are)



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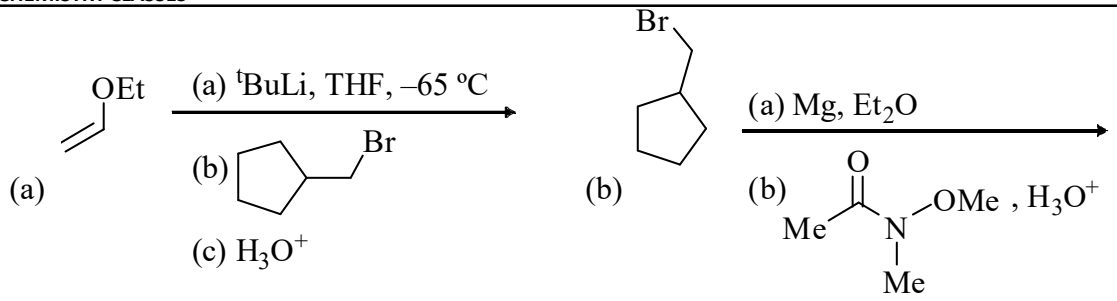

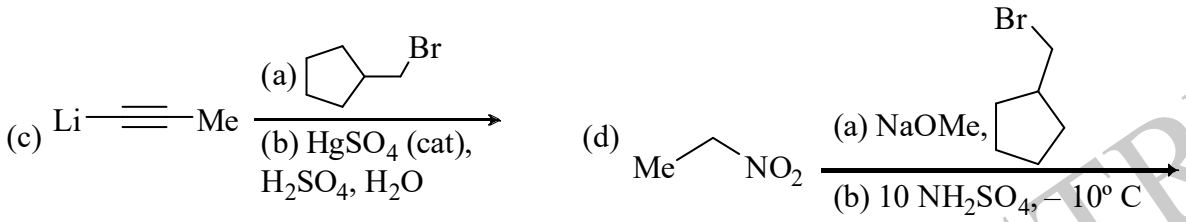

ANSWER KEY

1.	(*)	2.	(c)	3.	(a)	4.	(b)	5.	(b)	6.	(d)	7.	(a)
8.	(c)	9.	(c)	10.	(d)	11.	(c)	12.	(a)	13.	(b)	14.	(a)
15.	(c)	16.	(d)	17.	(b)	Z8.	(c)	19.	(a)	20.	(b)	21.	(c)
22.	(d)	23.	(c)	24.	(b)	25.	(b)	26.	(c)	27.	(c)	28.	(c)
29.	(d)	30.	(a)	31.	(b)	32.	(a)	33.	(c)	34.	(d)	35.	(c)
36.	(c)	37.	(b)	38.	(a)	39.	(c)	40.	(a)	41.	(b)	42	(a)
43.	(b)	44.	(c)	45.	(a)	46.	(4)	47.	(d)	48.	(*)	49.	(*)
50.	(*)	51.	(*)	52.	(*)	53.	(*)	54.	(*)	55.	(*)	56.	(*)
57.	(*)	58.	(*)	59.	(*)	60.	(b)	61.	(c)	62.	(*)	63.	(*)
64.	(a)	65.	(a,b)	66.	(*)	67.	(*)	68.	(*)	69.	(*)		

(*) Hinst & Solutions

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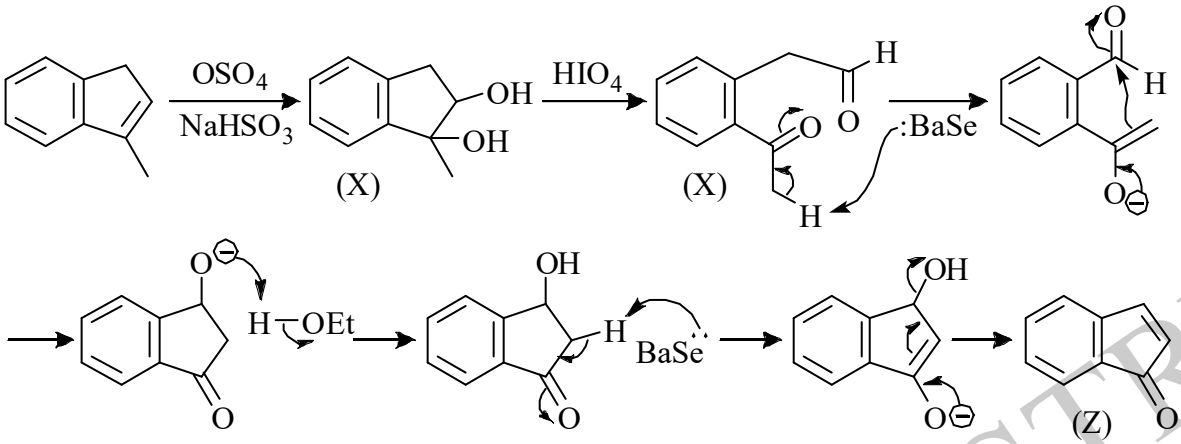
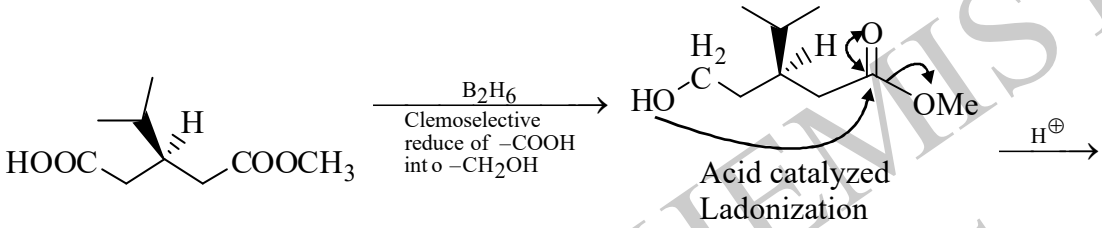
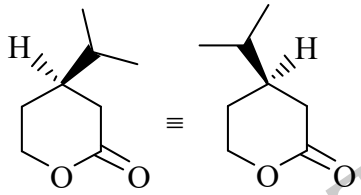
HINTS & SOLUTION

1.

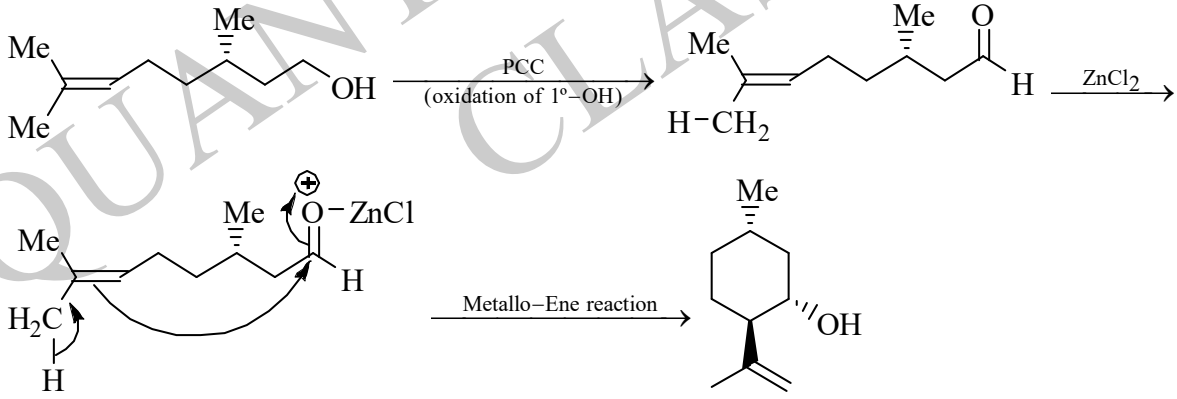


48.





49.



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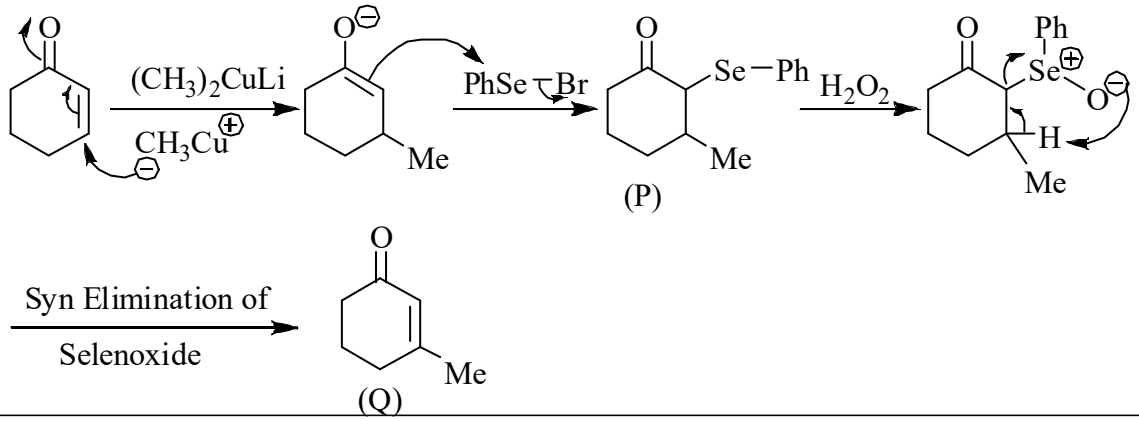
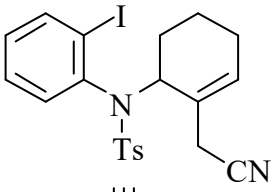
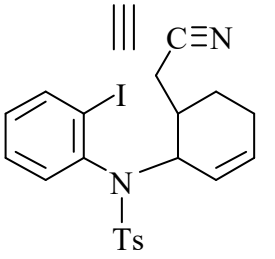


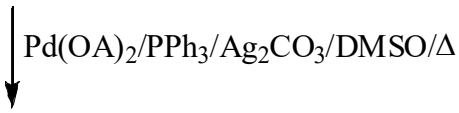
QUANTA CHEMISTRY CLASSES

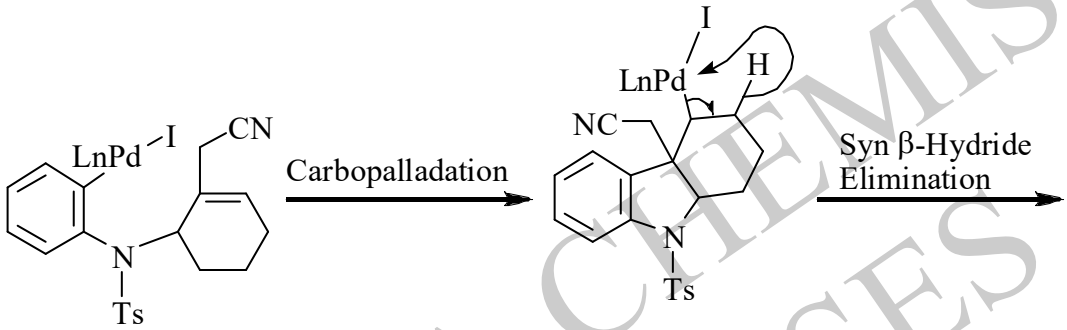
51.

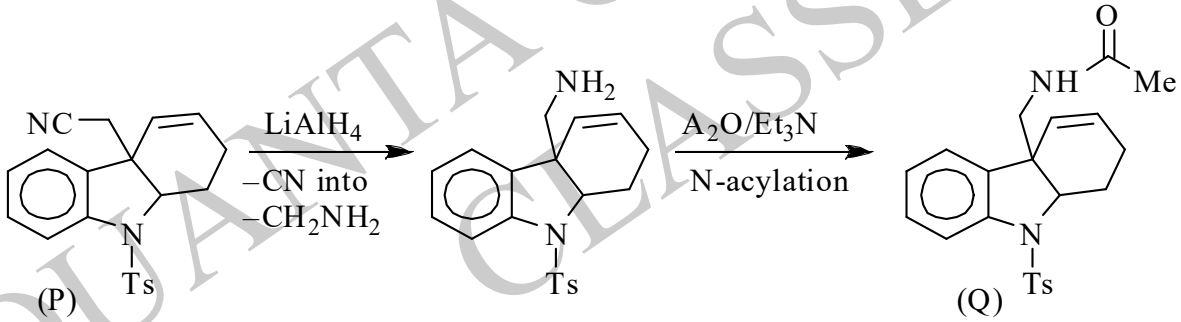


Intramoleculer Heck coupling with isomerigation of double bond









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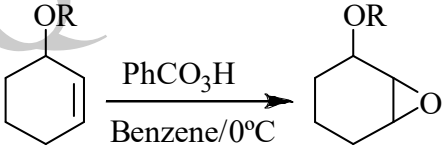
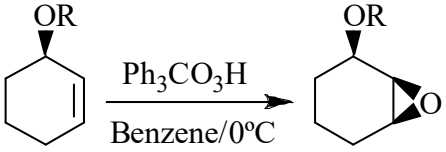
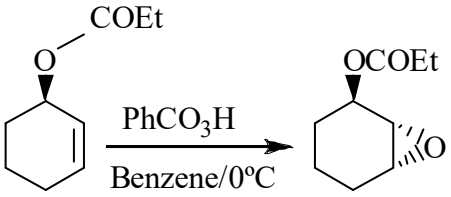


IF R = H



IF R = COEt

QUANTA CHEMISTRY CLASSES



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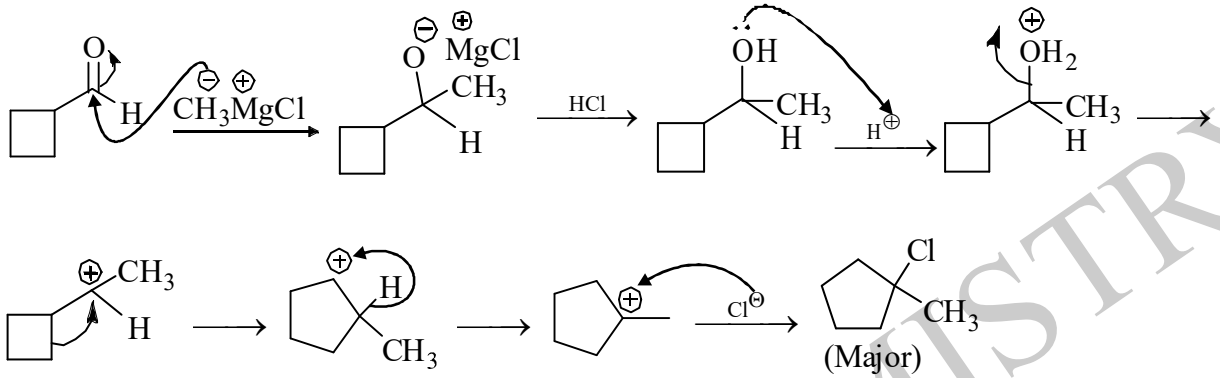

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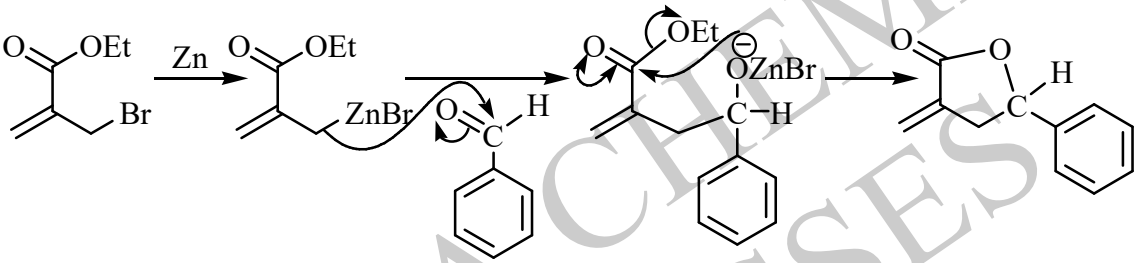

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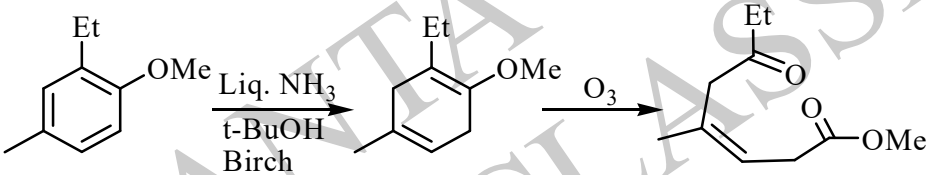

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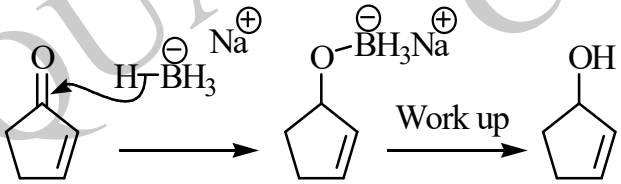

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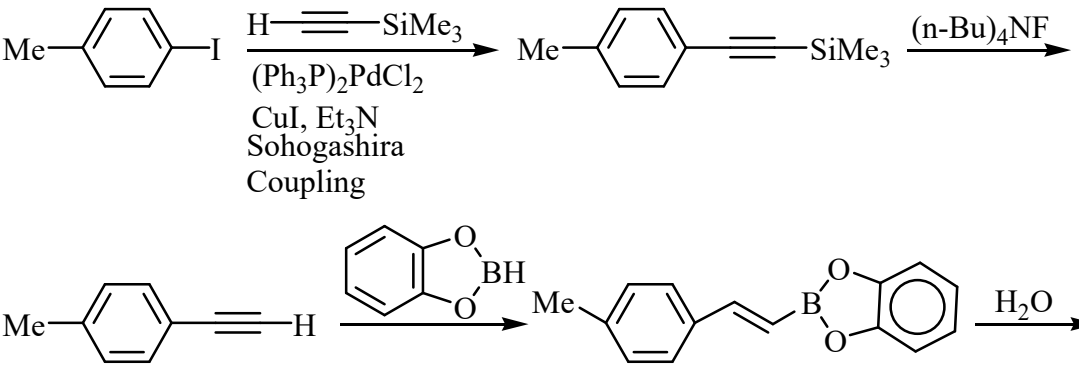
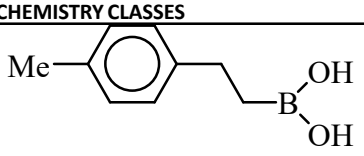
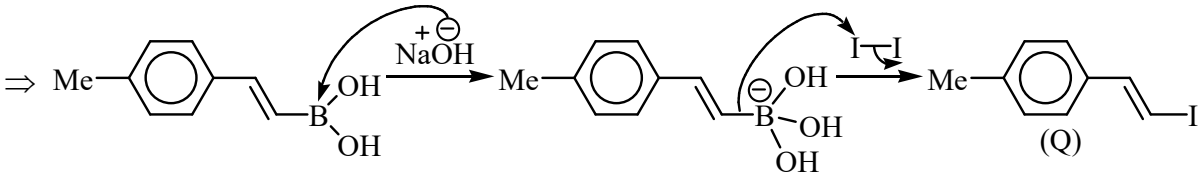
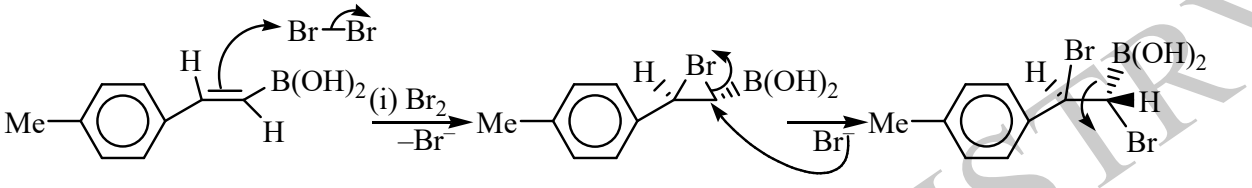


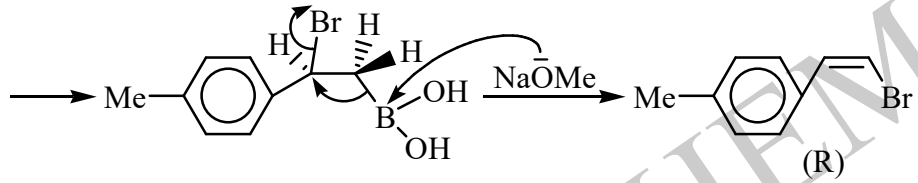
QUANTA CHEMISTRY CLASSES



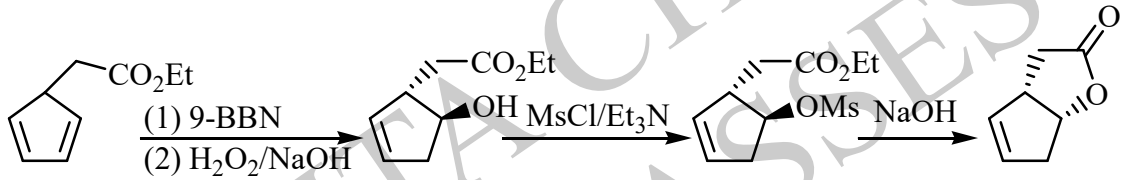
(P) Major product

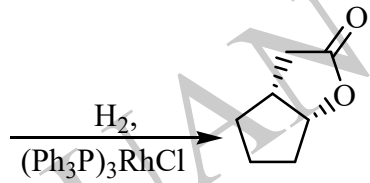


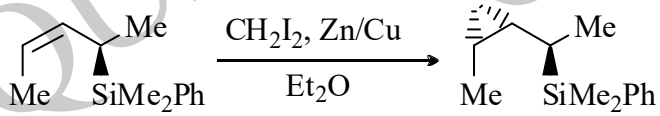




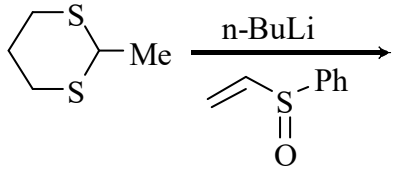
Correct option is (b)

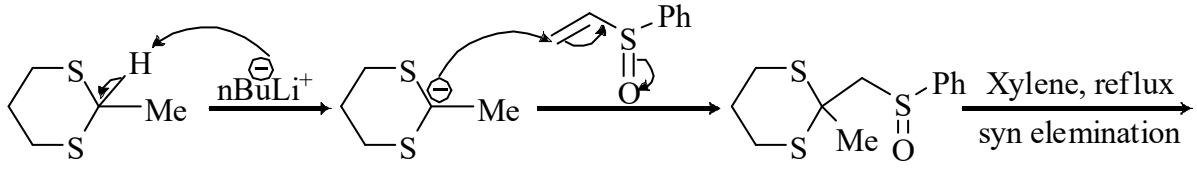
58. 



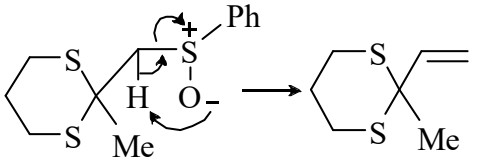
59. 

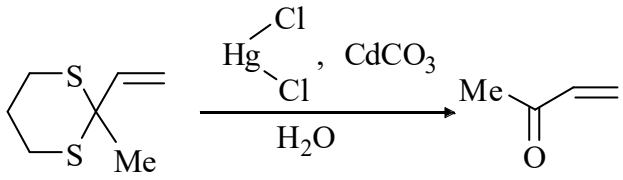
Correct option is (b)

62. 

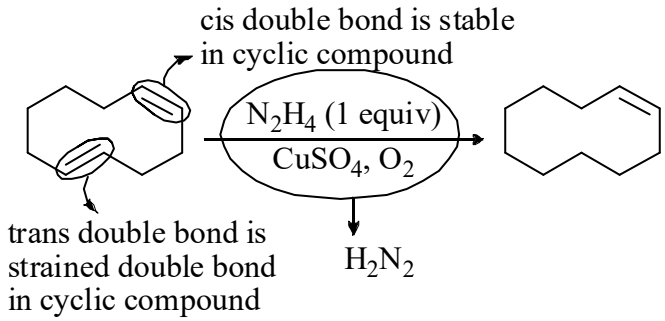


QUANTA CHEMISTRY CLASSES

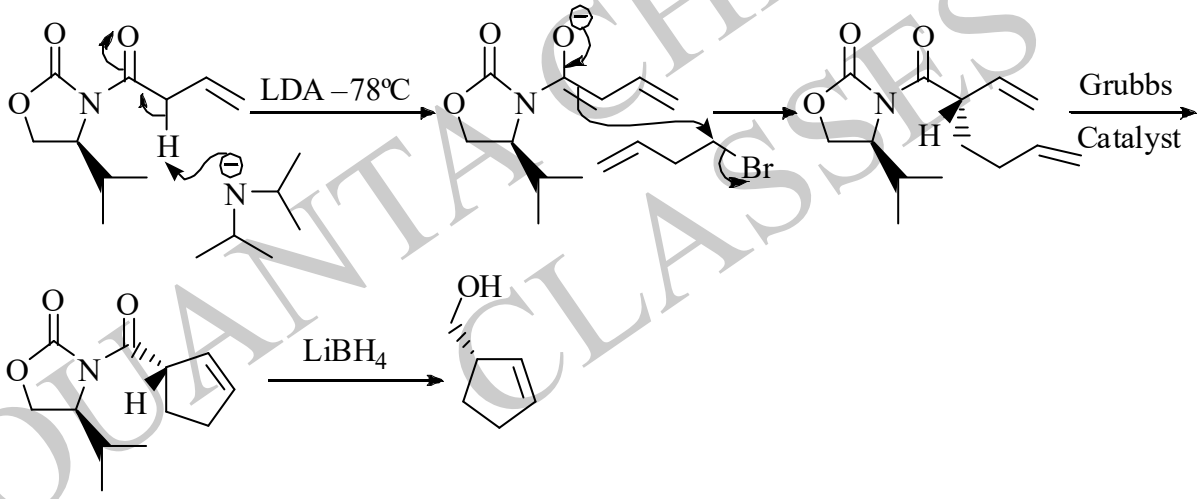




63.


cis double bond is stable in cyclic compound
N2H4 (1 equiv)
CuSO4, O2
H2N2
trans double bond is strained double bond in cyclic compound

66.



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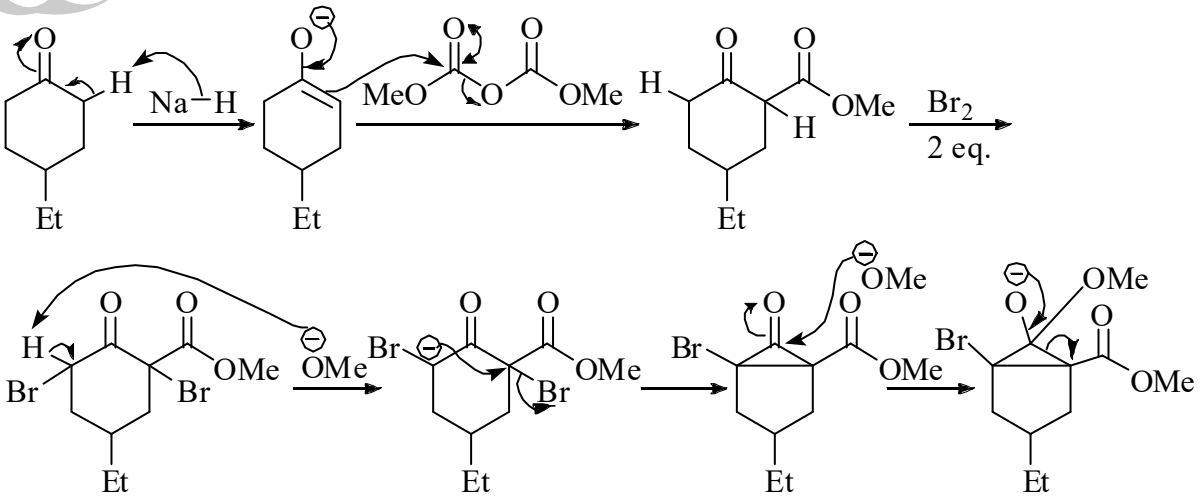
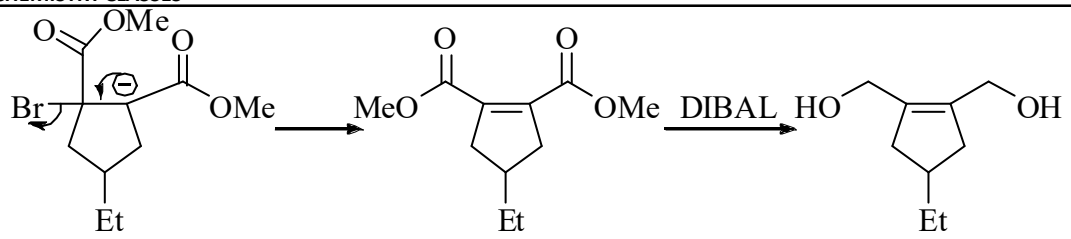
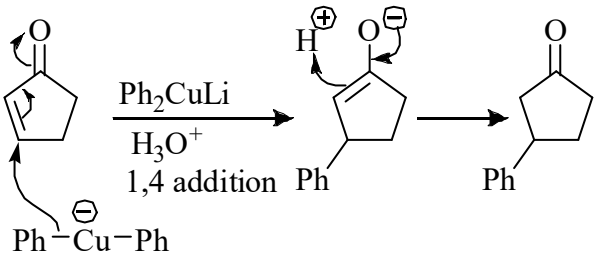


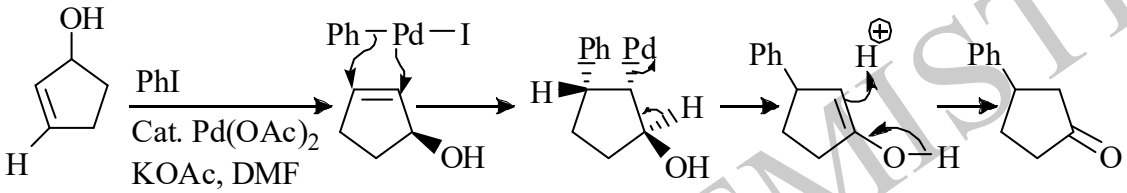
QUANTA CHEMISTRY CLASSES



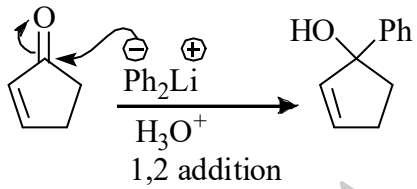
68. (a)



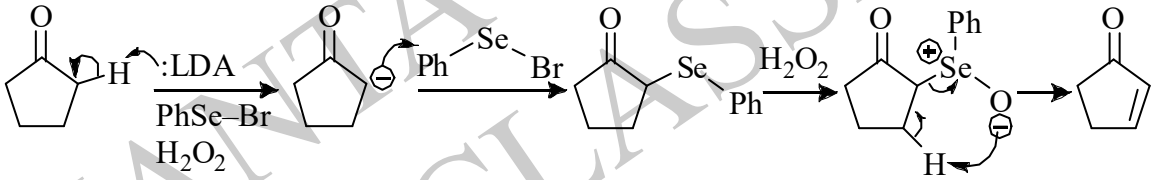
(b)



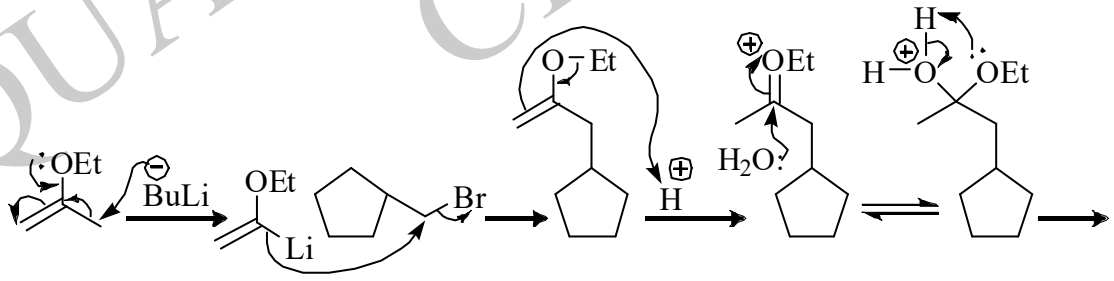
(c)

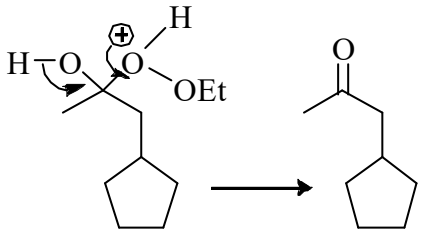


(d)



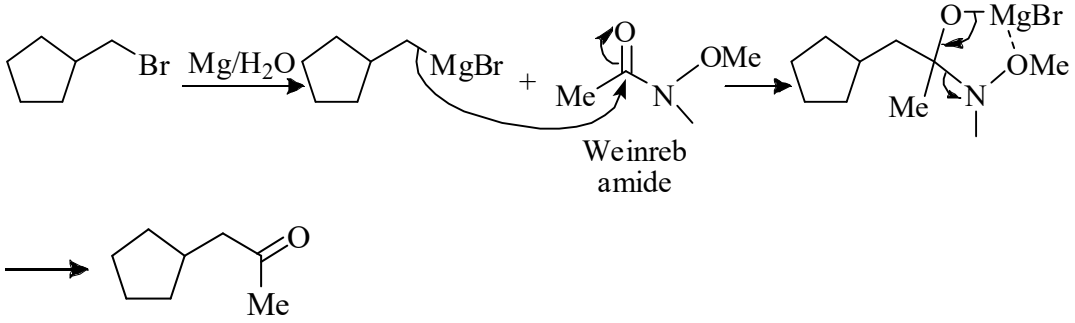
69. (a)



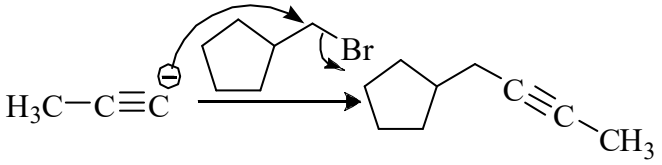


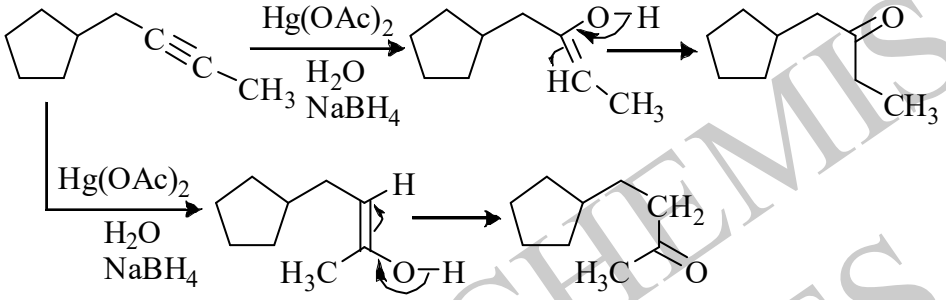
QUANTA CHEMISTRY CLASSES

(b)



(c)





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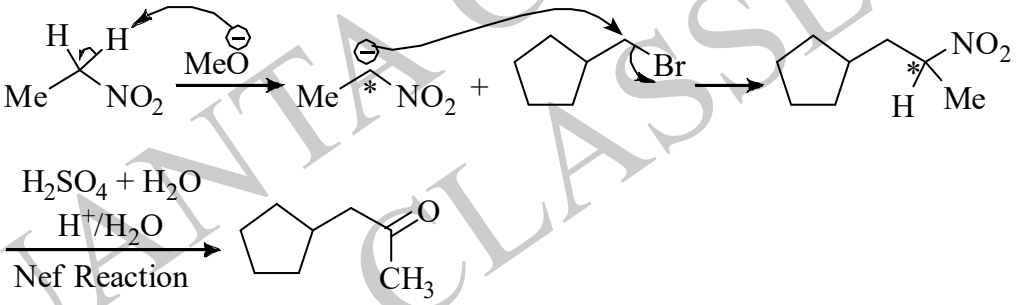


QUANTA CHEMISTRY CLASSES

QUANTA CHEMISTRY CLASSES

4

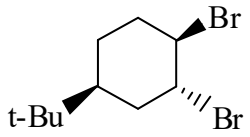
REACTION MECHANISM -I-II

GATE 2000

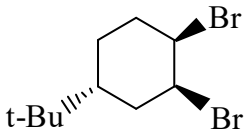
1. (E)-3-bromo-3-hexene when trated with CH_3O^- in CH_3OH gives

   (a) 3-hexyne (b) 2-hexyne (c) 2, 3-hexadiene (d) 2, 4-hexadiene

2. Account for the fact that only one of the following compounds A and B give the expected elimination product with KI in acetone

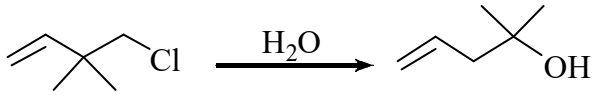


(A)

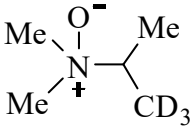


(B)

3. Suggest a plausible mechanism for the following hydrolysis reaction



GATE 2001

4. Pyrolysis of  would be

   (a) Amixture of $CH_2=CH-CD_3$ and $CH_3-CH=CD_2$

   (b) $CH_3-CH=CD_2$

   (c) $Me_2N^+=C(CD)_3(CH_3)$

   (d) $CH_2=CH-CD_3$

5. Arrange the following halides in the decreasing order of SN^1 reactivity

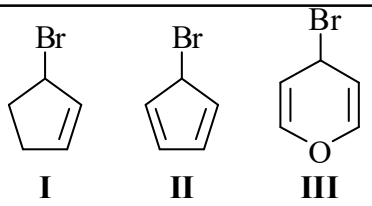
   $CH_3CH_2CH_2Cl$, $CH_2=CHCH(Cl)CH_3$, $CH_3CH_2CH(Cl)CH_3$

   (a) I > II > III (b) II > I > III (c) II > III > I (d) III > II > I

GATE 2002

6. Among the bromides I-III given below, the order of their reactivity in the S_N^1 reaction is:

QUANTA CHEMISTRY CLASSES



I **II** **III**

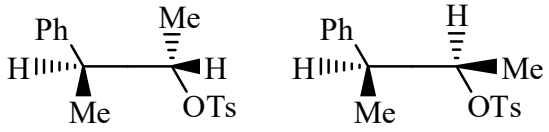
(a) III > II > I (b) II > III > I (c) III > I > II (d) II > I > III

GATE 2003

7. Contains a Statement (S) with a Reason (R) and an Assertion (A). for each question, choose the correct answer from the following four choices.

(a) Both R and A are correct (b) both R and A are wrong

(c) R is correct but A is wrong (d) R is wrong but A is correct

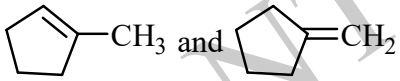


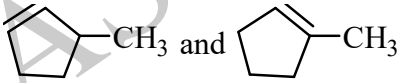
Statement : solvolysis of tosylates (I) and (II) shown above, in acetic acid yield the corresponding acetates.
Reason: Due to neighbouring group participation of the bridge phenonium ion, achiral intermediates are formed in both cases of (I) and (II).

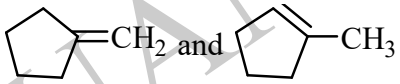
Assertion : Tosylate (I) gives an acetate with retention of configuration and tosylate (II) gives a recemic mixture of acetates.

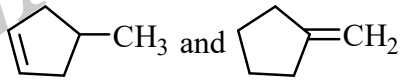
8. Two salkenes, X (91%) yield) and Y (9% yield) are formed when the following is heated.

The structures of X and Y, respectively are

(a) 

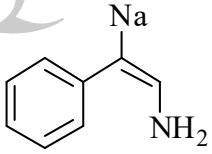
(b) 

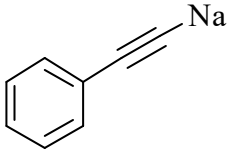
(c) 

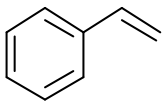
(d) 

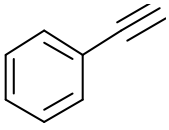
GATE 2004

9. Reaction of phenylacetylene with sodamide in liquid ammonia generates

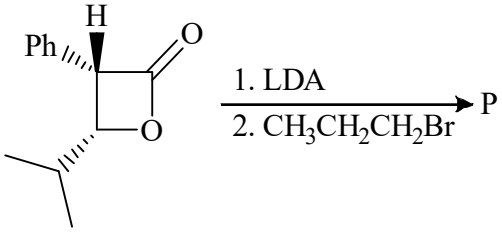
(a) 

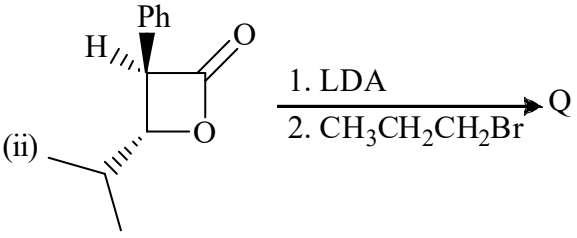
(b) 

(c) 

(d) 

10. With respect to the two reactions shown below, the correct statements about their stereochemical nature is [LDA = $LiN(^iPr_2]$

(i) 

(ii) 

(a) The reactions are stereoselective, because P and Q are the same.

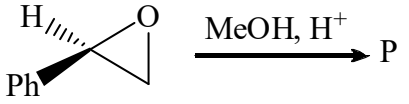
(b) The reactions are non – stereoselective, beause P and Q are the same.

QUANTA CHEMISTRY CLASSES

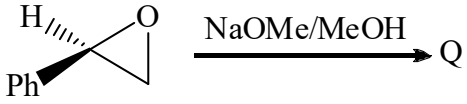
(c) The reactions are stereoselective, because P and Q are diastereomers.

(d) The reactions are enantioselective, because P and Q are enantiomers.

11. For the reactions shown below, identify the correct statement with regard to the product formed.

(i) 

(S) – styreneoxide

(ii) 

(S) – styreneoxide

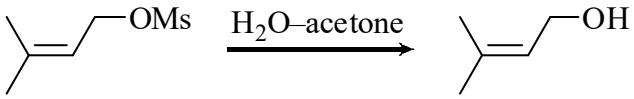
(a) P and Q are identical, both are optically active.

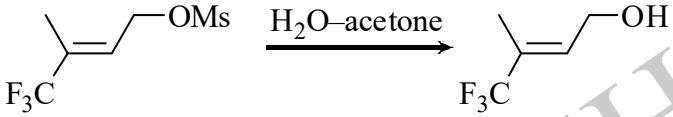
(b) P and Q are positional isomers, P is racemic and Q is optically active.

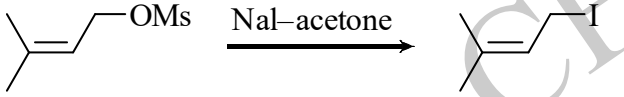
(c) P and Q are positional isomers, P is optically active and Q is racemic.

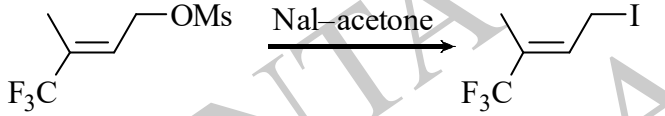
(d) P and Q are positional isomers, both are optically active.

12. **Statement:** Replacement of CH_3 with CF_3 decreases the rate decreases the rate of reaction I, but increases the rate of reaction II.



I. 



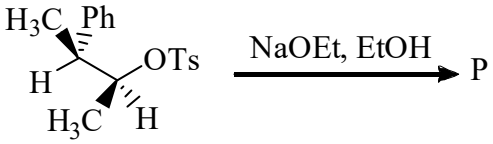
II. 

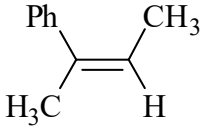
Reason: Reaction I proceeds through SN_1 mechanism and reaction II proceeds through SN_2 mechanism.

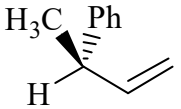
Assertion: Being an electron withdrawing group, CF_3 destabilizes the transition state inSN_1 reaction, but stabilizes the transition state in SN_2 reaction.

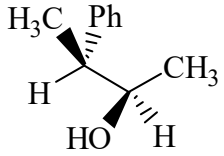
GATE 2005

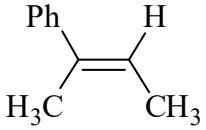
13. The major product P formed in the given



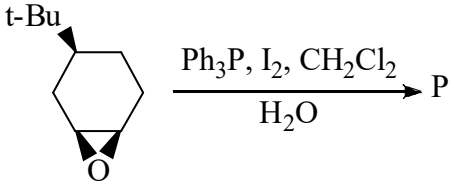
(a) 

(b) 

(c) 

(d) 

14. The major stereoisomer P obtained in the following reaction is:



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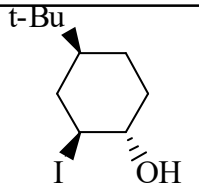
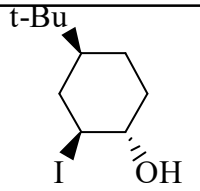
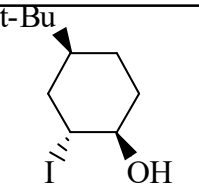
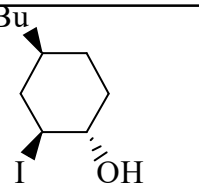
(a) 

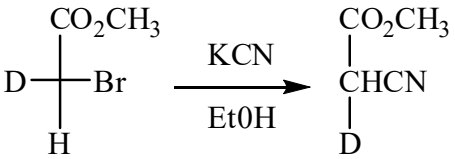
(b) 

(c) 

(d) 

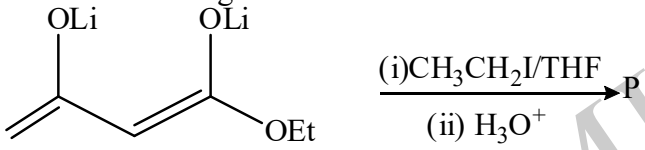
GATE 2006

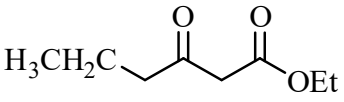
15. The configurations of the reactant and the product in the following reaction, respectively, are

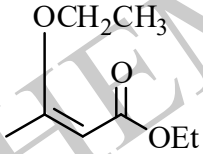


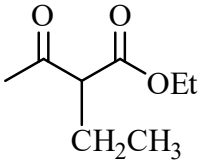
(a) R, R (b) R, S (c) S, R (d) S, S

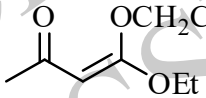
16. Identify the major product P in the following reaction:



(a) 

(b) 

(c) 

(d) 

GATE 2007

17. Classify the following species as electrophiles (E) and nucleophiles (N) in routine organic synthesis

SO_3 Cl^+ CH_3NH_2 H_3O^+ BH_3 CN^-

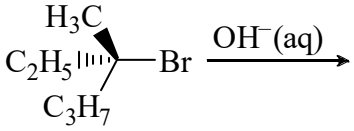
(a) $E = SO_3, Cl^+, BH_3$; $N = CH_3NH_2, H_3O^+, CN^-$

(b) $E = Cl^+, H_3O^+$; $N = SO_3, CH_3NH_2, BH_3, CN^-$

(c) $E = Cl^+, H_3O^+, BH_3$; $N = SO_3, CH_3NH_2, H_3O^+, CN^-$

(d) $E = SO_3, Cl^+, H_3O^+, BH_3$; $N = CH_3NH_2, CN^-$

18. In the reaction,



if the concentration of both the reactants is doubled, then the rate of the reaction will

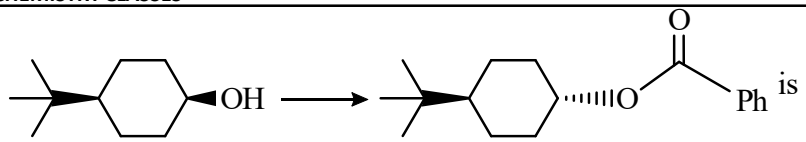
(a) remain unchanged (b) quadruple

(c) reduce to one fourth (d) double

GATE 2009

19. The most suitable reagent combination to bring out the following transformation

QUANTA CHEMISTRY CLASSES



(a) PhCOCl and pyridine (b) DCC and PhCOOH

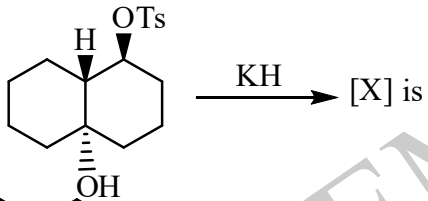
(c) PhBr, CO and $Pd(PPh_3)_4$ (d) EtOOC–N=N–COOEt, PPh_3 and PhCOOH

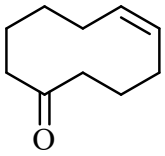
20. In the reaction, $Ph_3P \xrightarrow{MeI} [X] \xrightarrow{n-BuLi} [Y]$, the compounds X and Y, respectively are

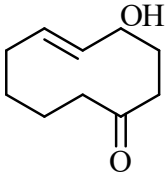
(a) $[Ph_3P(Me)I]; Ph_3P = CH - CH_2 - CH_3$ (b) $[Ph_3P(Me)][I]; Ph_3P = CH_2$

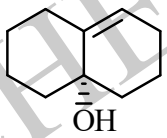
(c) $[Ph_3P(Me)_2]; Ph_3P = CH_2$ (d) $[Ph_3P(Me)][I]; Ph_3P$

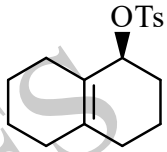
21. The major product X (based on the preferred conformation) in the reaction



(a) 

(b) 

(c) 

(d) 

GATE 2010

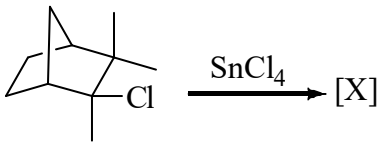
22. The decreasing order of nucleophilicity for the following anions is

$CH_3CO_2^-, CH_3O^-, C_6H_4O^-, NO_3^-$

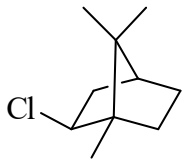
(a) $CH_3CO_2^- > CH_3O^- > C_6H_5O^- > NO_3^-$ (b) $CH_3O^- > NO_3^- > C_6H_5O^- > CH_3CO_2^-$

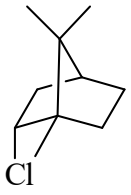
(c) $CH_3O^- > C_6H_5O^- > CH_3CO_2^- > NO_3^-$ (d) $C_6H_5O^- > CH_3O^- > NO_3^- > CH_3CO_2^-$

23. In the reaction,

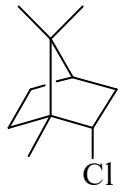


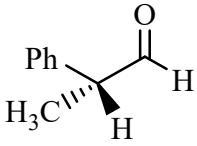
the major product [X] is

(a) 

(b) 

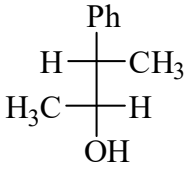
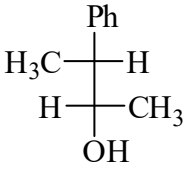
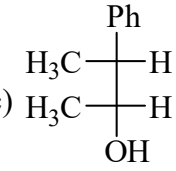
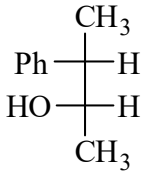
(c)

(d) 

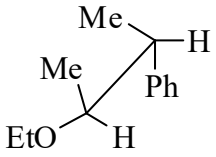
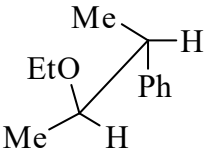
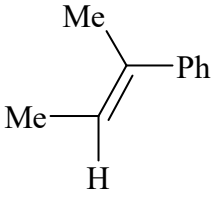
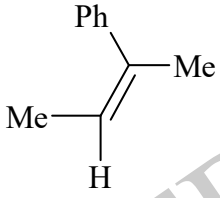
24. The compound [X] is: 

$\xrightarrow{(1)\ MeMgBr}$ [X] $\xrightarrow[(2)\ alc.KOH]{(1)\ TsCl/Py}$ [Z]

QUANTA CHEMISTRY CLASSES

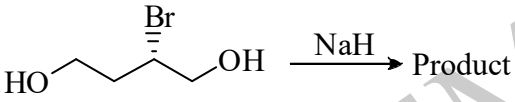
(a) 
(b) 
(c) 
(d) 

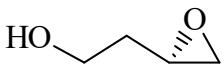
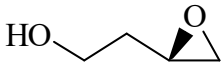
25. The compound [Z] is:

(a) 
(b) 
(c) 
(d) 

GATE 2012

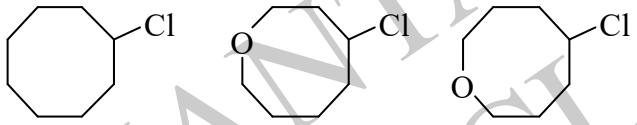
26. In the cyclization reaction given below, the most probable product formed is



(a) 
(b)
(c) 
(d)

GATE 2014

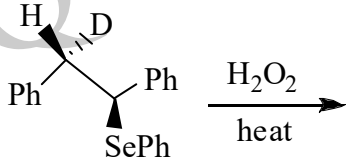
27. The correct order of the solvolysis for the following chlorides in acetic acid is

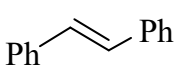
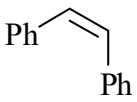
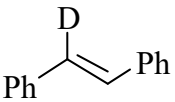
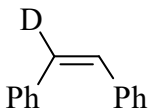


(I) (II) (III)

(a) II > I > III (b) III > II > I (c) III > I > II (d) I > III > II

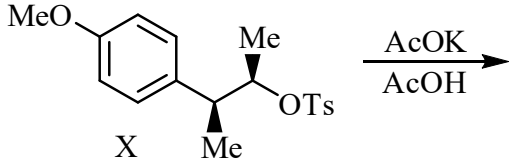
28. The major product formed in the following reaction is



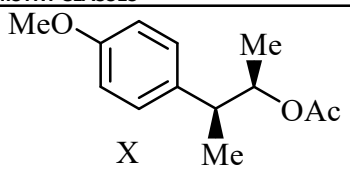
(a) 
(b) 
(c) 
(d) 

GATE 2015

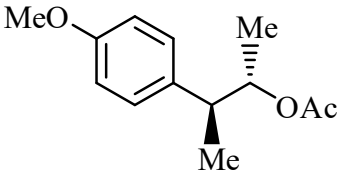
29. Solvolysis of the optically active compound X gives, mainly



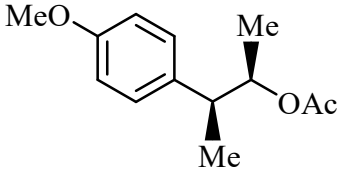
QUANTA CHEMISTRY CLASSES

(a) 

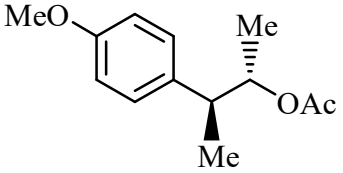
(Optically active)

(b) 

(Optically active)

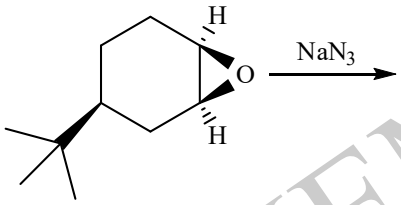
(c) 

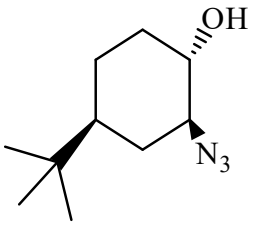
(Racemic Mixture)

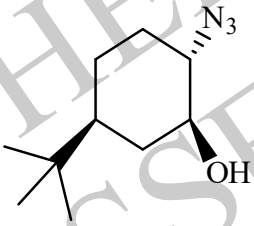
(d) 

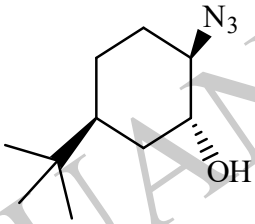
(Optically Inactive)

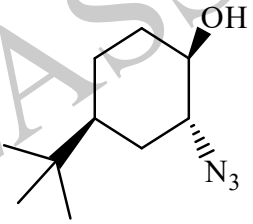
30. The major product formed in the following reaction is



(a) 

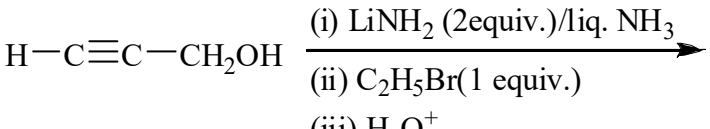
(b) 

(c) 

(d) 

GATE 2016

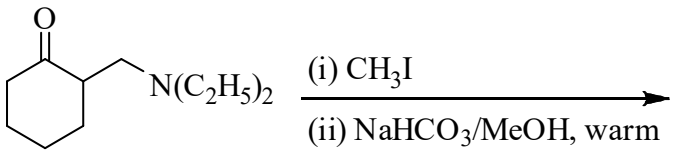
31. The major product obtained in the following reaction, is



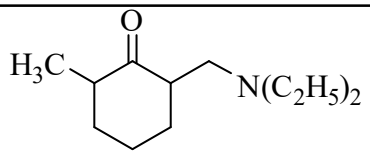
(a) $H_3CH_2C-C\equiv C-CH_2OH$ (b) $H-C\equiv C-CH_2OCH_2CH_3$

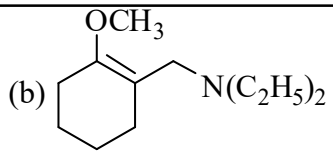
(c) $H_3CH_2C-C\equiv C-CH_2NH_2$ (d) $H-C\equiv C-CH_2NH-CH_2CH_3$

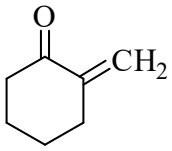
32. The major product formed in the following reaction, is

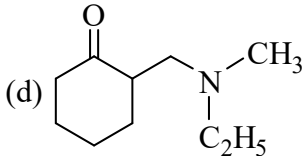


QUANTA CHEMISTRY CLASSES

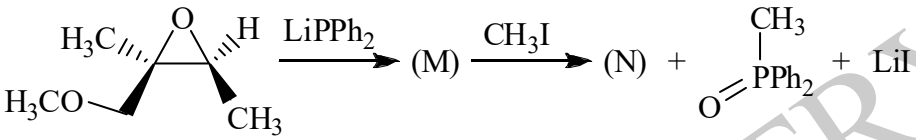
(a) 

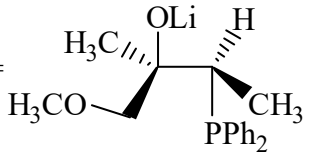
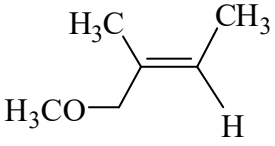
(b) 

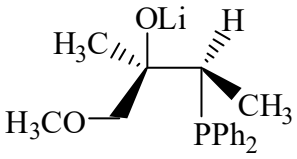
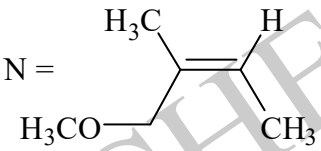
(c) 

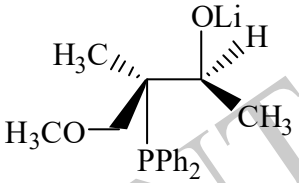
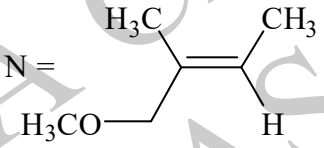
(d) 

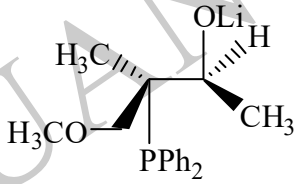
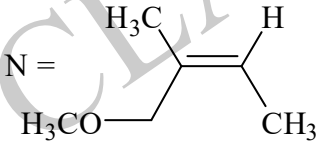
33. The major products M and N in the following reaction sequence are



(a) M =  N = 

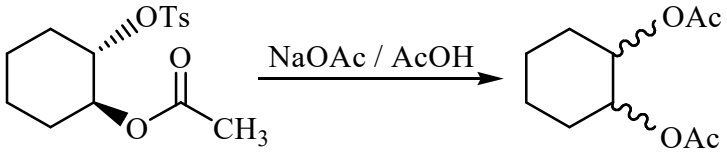
(b) M =  N = 

(c) M =  N = 

(d) M =  N = 

GATE 2017

34. The product obtained in the following solvolysis reaction is



Enantiomerically pure compound

(a) a racemic mixture of trans 1, 2 – diacetoxycyclohexane

(b) enantiomerically pure trans 1, 2 – diacetoxycyclohexane

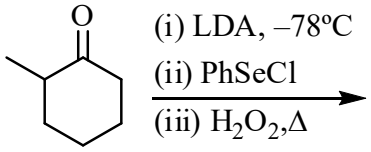
(c) racemic cis 1, 2 – diacetoxycyclohexane

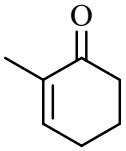
(d) a mixture of cis and trans 1, 2 – diacetoxycyclohexane

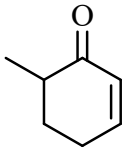
QUANTA CHEMISTRY CLASSES

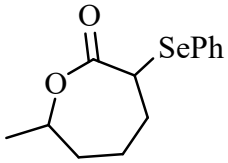
GATE 2018

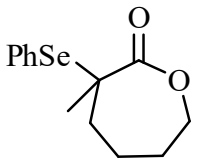
35. The major product formed in the following reaction sequence is



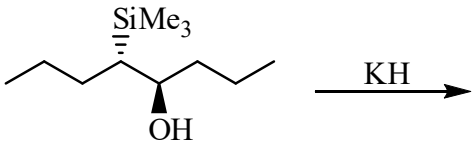
(a) 

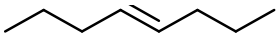
(b) 

(c) 

(d) 

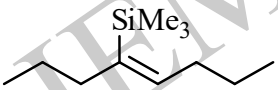
36. The major product of the following reaction is



(a) 

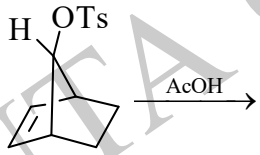
(b)

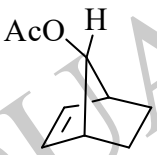
(c)

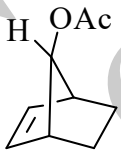
(d) 

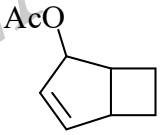
GATE 2019

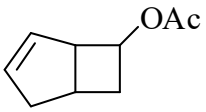
37. The major product formed in the following reaction is



(a) 

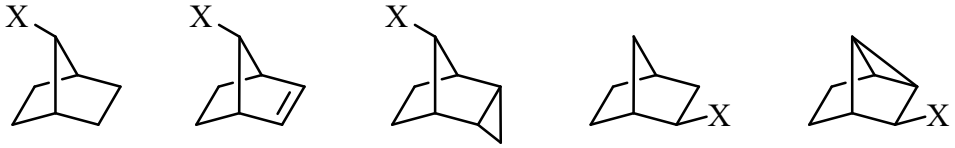
(b) 

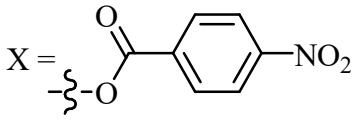
(c) 

(d) 

GATE 2020

38. The rate of solvolysis of the given compounds is in the order:

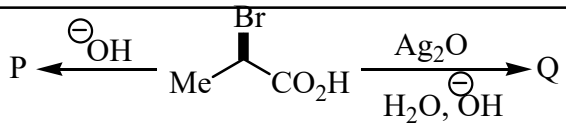




(a) Q > T > R > P > S
(b) T > Q > R > P > S
(c) T > R > Q > S > P
(d) R > T > Q > S > P

39. The CORRECT statement with respect to the stereochemistry of α-hydroxy acids P and Q formed in the following reactions is:

QUANTA CHEMISTRY CLASSES



(a) P is formed with inversion of configuration and Q with retention of configuration.

(b) Both P and Q are formed with retention of configuration.

(c) P is formed with retention of configuration and Q with inversion of configuration.

(d) Both P and Q are formed with inversion of configuration.

PART- 2 (Aromatic Substution)

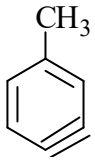
GATE 2000

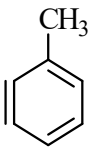
1. Suggest a suitable method and write all the steps for the following transformations

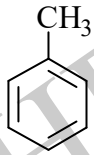
(i) anisole to 2-cyclohexenone

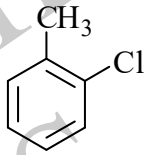
GATE 2001

2. o-Chlorotoluene reacts with sodamide in liquid ammonia to give o-toluidine, and m-toluidine. This reaction proceeds through an intermediate

(a) 

(b) 

(c) 

(d) 

3. The decreasing order of reactivity of meta-nitrobromobenzene (I); 2, 4, 6-trinitrobromobenzene (II); paranitrobromobenzene (III); and 2, 4-dinitrobromobenzene (IV) towards OH^- ions is

(a) I > II > III > IV (b) II > IV > III > I (c) IV > II > III > I (d) II > IV > I > III

GATE 2002

4. Reaction of phenyl acetate with anhydrous aluminium chloride generates a mixture of

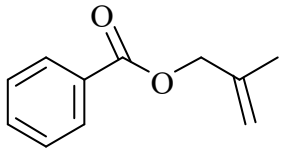
(a) ortho-, meta- and para-hydroxyacetophenones

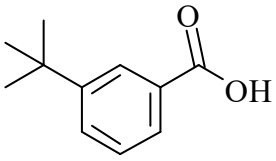
(b) meta- and para-hydroxyacetophenones

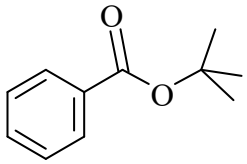
(c) ortho- and meta-hydroxyacetophenones

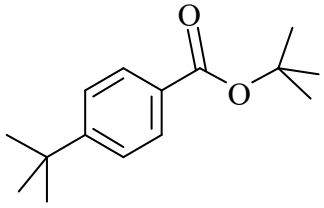
(d) ortho- and para-hydroxyacetophenones

5. The major product formed in the raction benzoic acid with iobutylene in the presence of a catalytic amount of sulfuric acid is:

(a) 

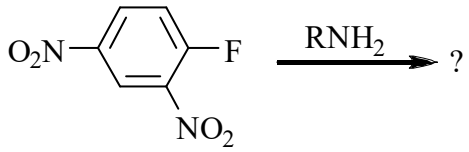
(b) 

(c) 

(d) 

6. Identify the structure of the major product formed in the following reaction, and give a mechanism of its formation.

QUANTA CHEMISTRY CLASSES



7. Identify the reactive intermediate involved in the reaction of furan with a mixture of HNO_3 and H_2SO_4. Write the mechanism and the structure of the final product.

GATE 2003

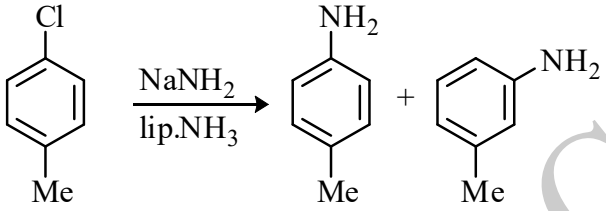
8. Among the halobenzenes, the one that undergoes electrophilic aromatic substitution most readily and the reason for its higher reactivity are

(a) flurobenzene; the benzenonium ion intermediate is stablished by 2p (F), 2p (C) overlap which is most efficient

(b) chlorobenzene; very high electron affinity of chlorine considerably lowers the energy of activation of the reaction

(c) bromobenzene; high polarising power of the halogen atom helps in effective stabilisation of the benzenonium ion intermediate

(d) iodobenzene; iodine atom has the lowest electronegativity and hence electron density of the phenyl ring is least disturbed

9. 

The above reaction is an example of

(a) nuclephilic substitution of addition-elimination mechanism

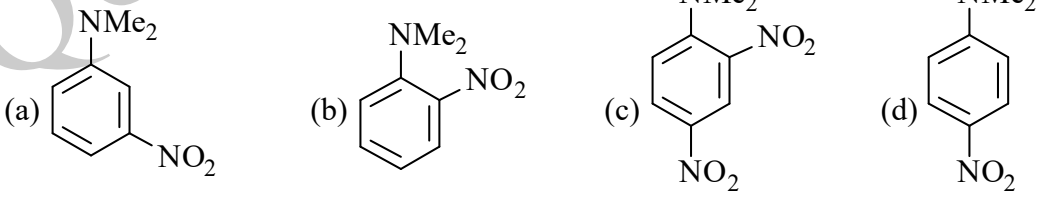
(b) electrophilic substitution by addition-elimination mechanism

(c) radical substitution reaction

(d) nuclephilic substitution involving benzyne intermediate

GATE 2004

10. The major product formed on nitration of N, N–dimethylaniline with conc. $H_2SO_4HNO_3$ mixture is



11. In electrophilic aromatic substitution reactions, nitro group is meta – directing, becaused the nitro group

(a) increase electron density at meta – position

(b) increase electron density at ortho – and para – positions

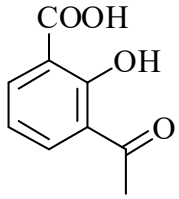
(c) decreases electron density at meta – position

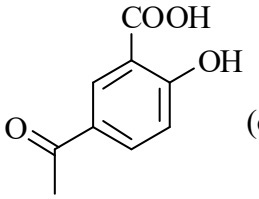
(d) decreases electron density at ortho – and para – positions

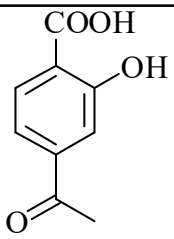
GATE 2005

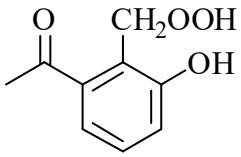
12. The major product of the acetylation of salicylic acid with Ac_2O/H^+ followed by heating with anhydrous $AlCl_3$ is

QUANTA CHEMISTRY CLASSES

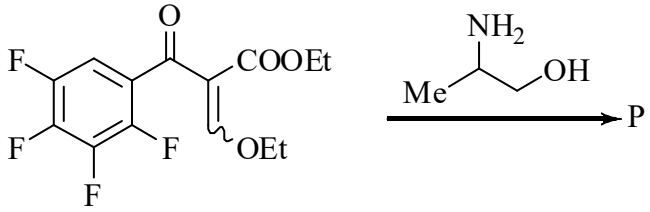
(a) 

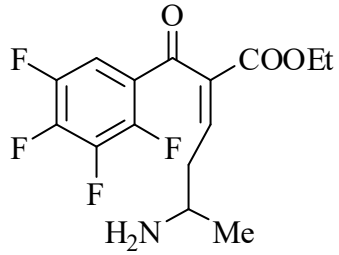
(b) 

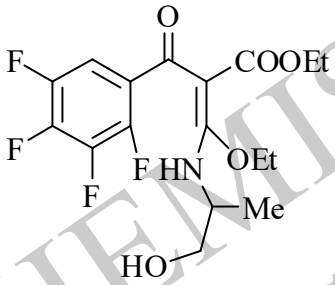
(c) 

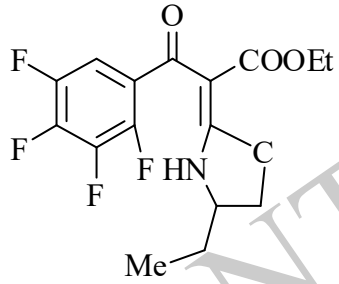
(d) 

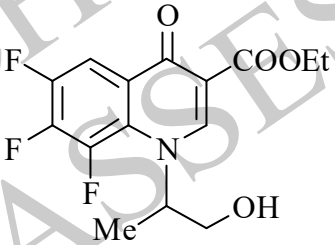
13. The major product P of the following reaction is



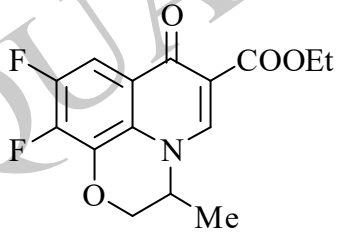
(a) 

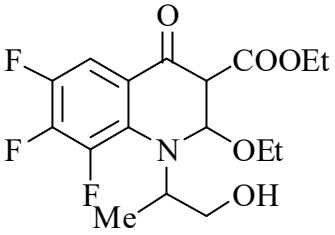
(b) 

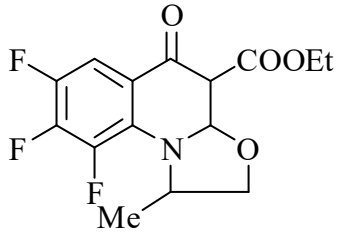
(c) 

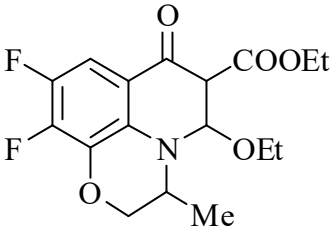
(d) 

14. Major compound Q obtained on reaction of P with NaH in DMF is:

(a) 

(b) 

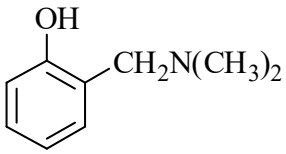
(c) 

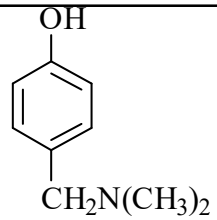
(d) 

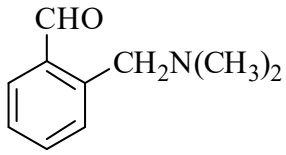
GATE 2007

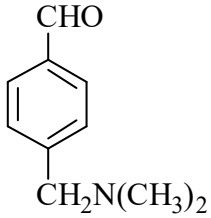
15. Phenol on reaction with formaldehyde and dimethyl amine mainly gives

QUANTA CHEMISTRY CLASSES

(a) 

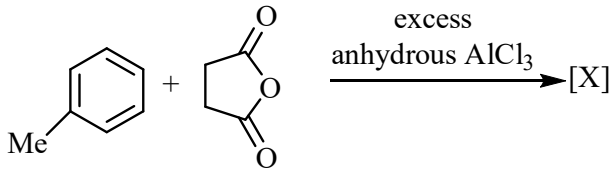
(b) 

(c) 

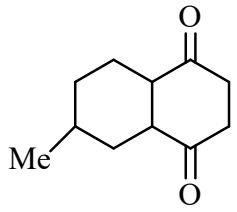
(d) 

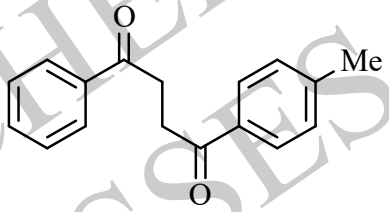
GATE 2009

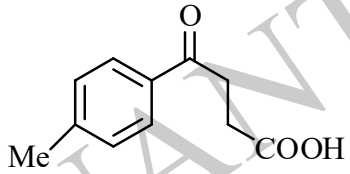
16. In the reaction,

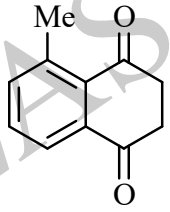


the major product X is:

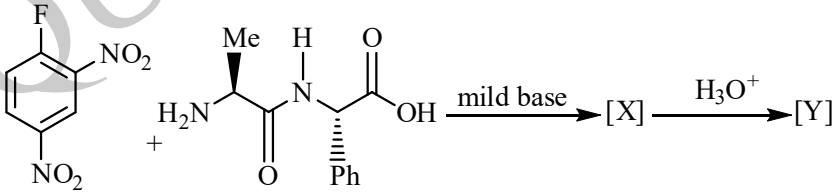
(a) 

(b) 

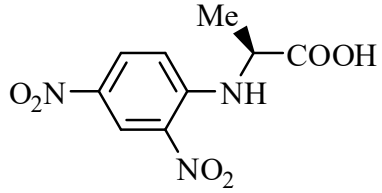
(c) 

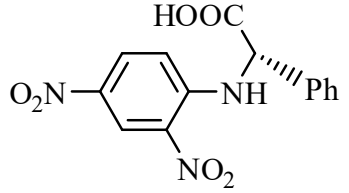
(d) 

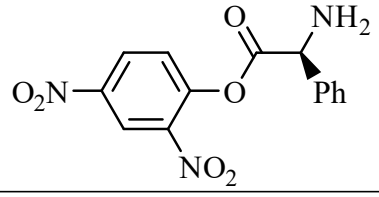
17. In the two steps reaction sequence:

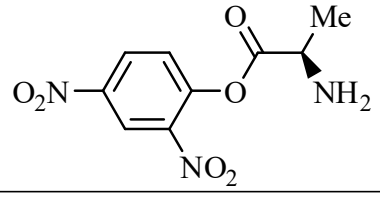


the major product Y is:

(a) 

(b) 

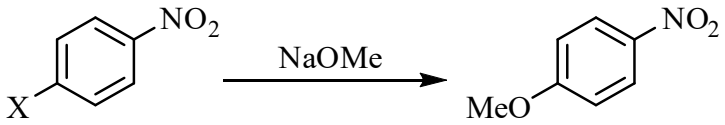
(c) 

(d) 

QUANTA CHEMISTRY CLASSES

GATE 2015

18. The correct oder of reactivity of p-halonitrobenzenes in the following reaction is



(X = F, Cl, Br, I)

(a) p-chloronitrobenzene > p-iodonitrobenzene > p-fluoronitrobenzene > p-bromonitrobenzene

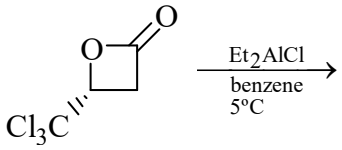
(b) p-fluoronitrobenzene > p-chloronitrobenzene> p-bromonitrobenzene > p-iodonitrobenzene

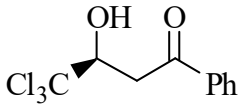
(c) p-iodonitrobenzene > p-bromonitrobenzene > p-chloronitrobenzene > p-fluoronitrobenzene

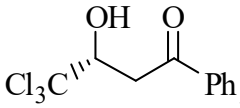
(d) p-bromonitrobenzene > p-fluoronitrobenzene > p-iodonitrobenzene > p-chloronitrobenzene

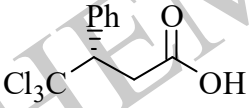
GATE 2019

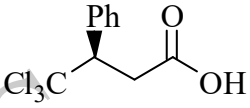
19. The major product formed in the following reaction is



(a) 

(b) 

(c) 

(d) 

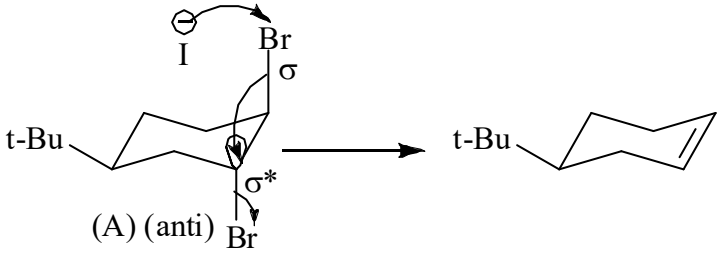
HINTS & SOLUTION

1.	(c)	2.	(*)	3.	(*)	4.	(d)	5.	(c)	6.	(c)	7.	(d)
8.	(c)	9.	(b)	10.	(a)	11.	(d)	12.	(*)	13.	(d)	14.	(c)
15.	(d)	16.	(a)	17.	(d)	18.	(d)	19.	(d)	20.	(b)	21.	(b)
22.	(c)	23.	(b)	24.	(c)	25.	(c)	26.	(c)	27.	(b)	28.	(c)
29.	(c)	30.	(d)	31.	(a)	32.	(c)	33.	(a)	34.	(a)	35.	(b)
36.	(b)	37.	(b)	38.	(c)	39.	(a)						

QUANTA CHEMISTRY CLASSES

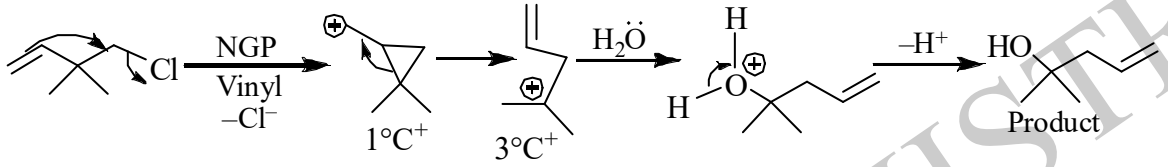
HINTS & SOLUTION

2. $KI \xrightarrow{\text{acetone}} K^+ + I^-$

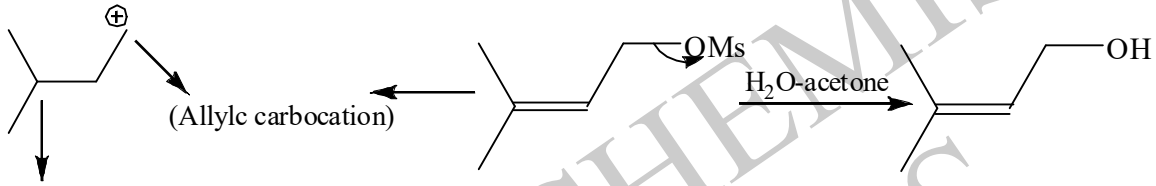


This reaction is an example of didehalogination raction. It is a E_2 elimination and proceed from anti-conformation.

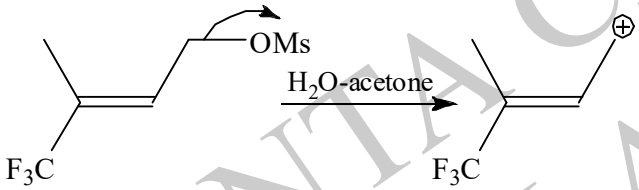
3.



12.



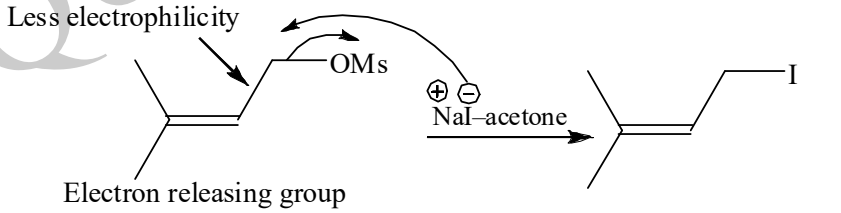
(more stable carbocation due o +I as well as hyperconjugation effect (+) H)

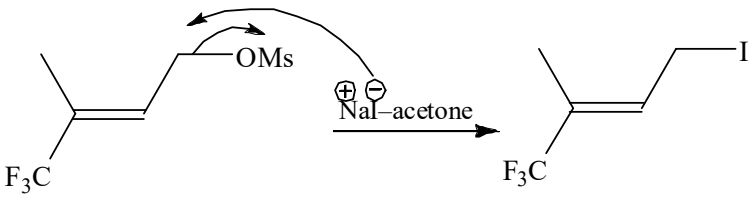


Stability of the carbocation decrease due to electron withdrawing group

(Above reaction proceeds through S_N1 mechanism)

Reaction-II : Reaction proceed through S_N2 mechanism





electron withdrawing group create more electrophilicity

In S_N1 reaction rate of reaction depends upon stability of carbocation. So, electron releasing group stabilizes the

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carbocation.

In S_N2 reaction, rate of reaction $\propto$ [reactant] [Nu^-] more electrophilic centre, fast the rate of reaction.

Electron withdrawing group increase the rate of reaction

Both Reason and Assertion are correct.

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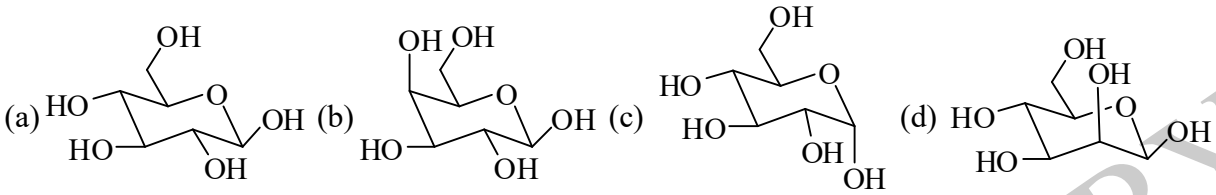
5

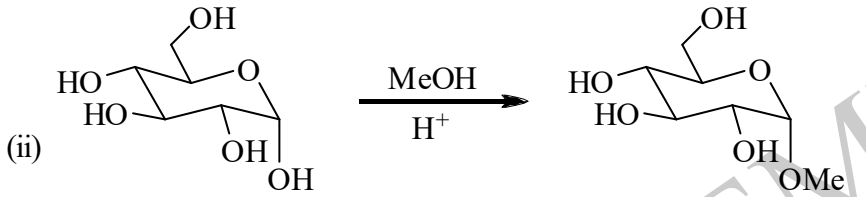
NATURAL PRODUCTS & BIOMOLECULES

GATE 2000

1. β-D-Glucose is represented as



2. Suggest a suitable mechanism for each of the following reactions



α-D-Glucopyranose Methyl-α-D-Glucoside

GATE 2001

3. Which one of the following compunds will form as osazone derivative?

(a) $CH_3CH_2COCH_2OH$ (b) $CH_3COCH_2CH_2OH$

(c) $CH_3CH_2CHOHCH_2OH$ (d) $CH_3CH_2COCH_2OCH_3$

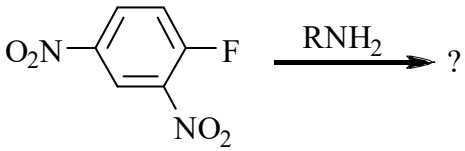
4. D-Glucose and D-fructose interconvert into each other in aqueous alkaline solution. Suggest a mechanism for the interconversion.

GATE 2002

5. Proteins are biopolymers. The monomer units present in them are

(a) carbohydrates (b) amino acids (c) fatty acids (d) alkenes

6. Identify the structure of the major product formed in the following reaction, and give a mechanism of its formation.



GATE 2004

7. For the aldotetroses I – IV, the combination of TRUE statements, among P – T, is:

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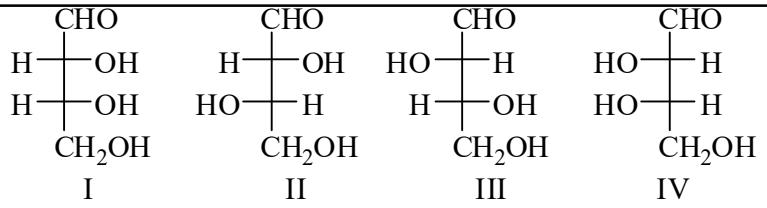


I II III IV

P = I and II are diastereomers and II and III are enantiomers.

Q = I and IV are mesomers and are optically inactive.

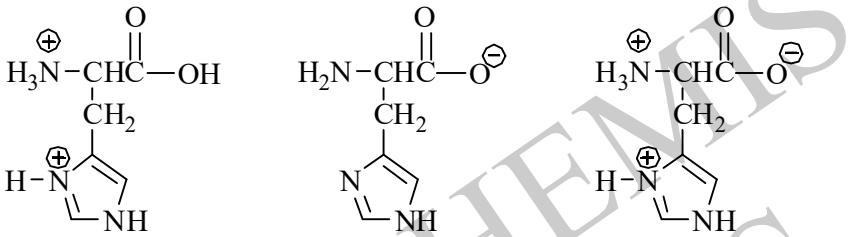
R = I and III can be interconverted by a base catalysed isomerisation.

S = only I and IV are HIO_4 cleavable.

T = I and III are D – sugars and II and IV are L – sugars.

(a) Q, R, T (b) P, R, T (c) Q, S, T (d) P, Q, S

8. Three molecular ionic states, P – R, are possible for the amino acid histidine. Identify the correct choice of pH values, respectively, for the observation of the ionic states P – R.

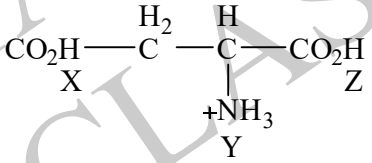


(a) P at pH 1 : Q at pH 12 : R at pH 7 (b) P at pH 7; Q at pH 1; R at pH 12

(c) P at pH 12; Q at pH 7; R at pH 1 (d) P at pH 12; Q at pH 1; R at pH 7

GATE 2005

9. The pK_a values for the three ionizable groups X, Y and Z of glutamic acid are 4.3, 9.7 and 2.2 respectively



The isoelectric point for the amino acid is

(a) 7.00 (b) 3.25 (c) 4.95 (d) 5.95

10. contain a Statement with a Reason and an Assertion. For each question, choose the correct answer from the following four choices.

(a) Both Reason and Assertion are correct (b) Both Reason and Assertion are wrong

(c) Reason is correct but Assertion is wrong (d) Reason is wrong but Assertion is correct

Statement: D – Glucose and D – mannose give the same phenylosazone.

Reason: Osazone formation results in a loss of the stereocentre at C_2 but does not affect other stereocenters.

Assertion: D – Glucose and D – mannose are enantiomers.

11. contain a Statement with a Reason and an Assertion. For each question, choose the correct answer from the following four choices.

(a) Both Reason and Assertion are correct (b) Both Reason and Assertion are wrong

(c) Reason is correct but Assertion is wrong (d) Reason is wrong but Assertion is correct

Statement: Nucleosides are stable in dilute base but undergo hydrolysis in dilute acid.

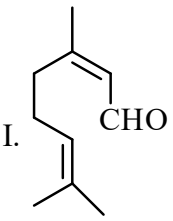
Reason: Nucleosides have an N – glycosidic linkage.

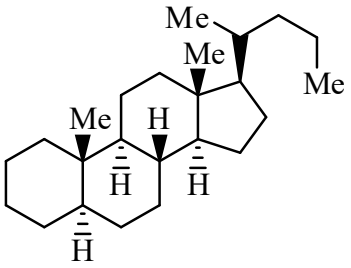
QUANTA CHEMISTRY CLASSES

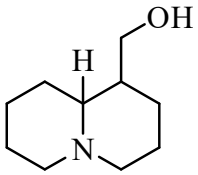
Assertion: N – Glycosidic linkage behaves like an O – glycosidic linkage which is rapidly hydrolyzed by aqueous acid but stable in aqueous base.

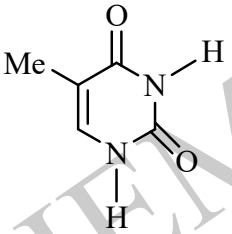
GATE 2006

12. Match the following compounds with their respective classes.

I. 

II. 

III. 

IV. 

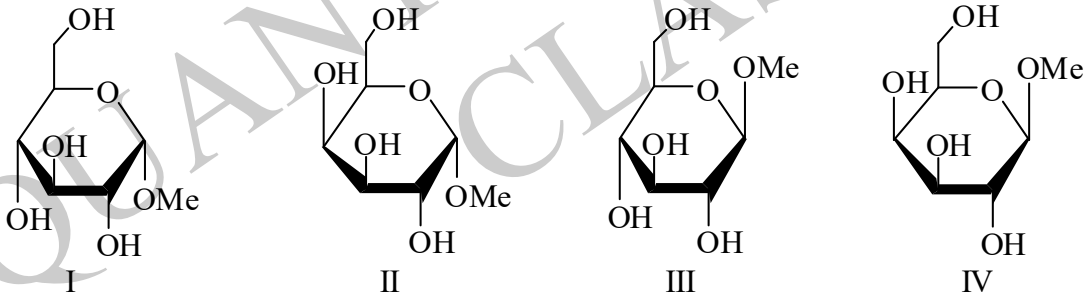
(a) I: Steroid; II: terpenoid; III: alkaloid; IV DNA base

(b) I: terpenoid; II; steroid; III: alkaloid; IV: DNA base

(c) I:terpenoid; II: steroid; III: DNA base; IV: alkaloid.

(d) I:steroid; II: terpenoid; III: DNA base; IV: alkaloid.

13. Identify the Correct set of stereochemical relationships amongst the following monosaccharides I-IV



(a) I and II are anomers; III and IV are epimers

(b) I and III are epimers; II and IV are anomers

(c) I and II are epimers; III and IV are anomers

(d) I and III are anomers; I and II are epimers.

14. Select the correct pair of statements:

(I) Complementary strands run antiparallel in a double stranded DNA.

(II) The triplet codons, represented by the genetic code, are expressed by ribonucleic acids.

(III) t-RNA carries the genetic information to the site of DNA replication.

(IV) A nucleoside contains a ribose or deoxyribose and phosphate constituents only.

(a) I and II (b) II and III (c) III and IV (d) I and IV

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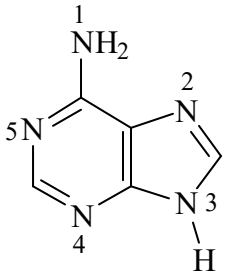
GATE 2007

15. Sucrose is converted to a mixture of glucose and fructose in a pseudo first order process under alkaline conditions. The reaction has a half life of 28.4 min. The time required for the reduction of a 8.0 mM sample of sucrose to 1.0 mM is

(a) 56.8 min (b) 170.4 min (c) 85.2 min (d) 227.2 min

16. The mono protonation of adenine (X) in acidic solution



(X)

mainly occurs at

(a) position 1 (b) position 2

(c) position 3 (d) either position 4 or 5

17. Treatment of the pentapeptide Gly-Arg-Phe-Ala-Ala, in separate experiments, with the enzymes Trypsin, Chemotrypsin and Carboxypeptidase A respectively, gives :

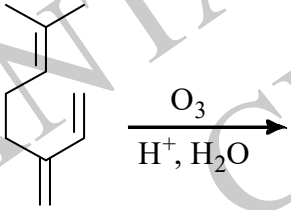
(a) Gly-Arg + Phe-Ala-Ala; Gly-Arg-Phe+Ala-Ala; Gly-Arg-Phe-Ala+Ala

(b) Gly-Arg-Phe+Ala-Ala; Gly-Arg-Phe+Ala-Ala; Gly-Arg-Phe-Ala+Ala

(c) Gly-Arg+Phe-Ala-Ala; Gly-Arg-Phe-Ala+Ala; Gly-Arg-Phe+Ala-Ala

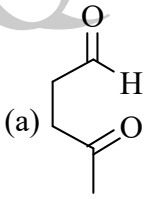
(d) Gly-Arg + Phe-Ala-Ala; Gly-Arg-Phe+Ala-Ala; Gly+ Arg-Phe- Ala + Ala

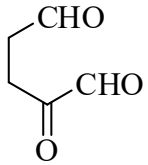
18. In the reaction,

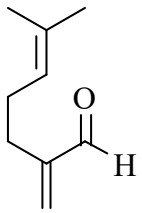


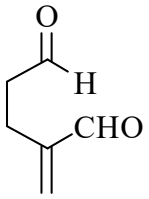
(X) + Acetone + 2 Formaldehyde

Compound X is

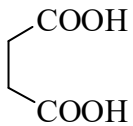
(a) 

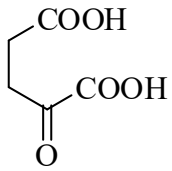
(b) 

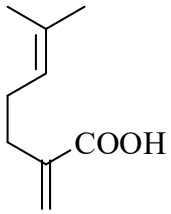
(c) 

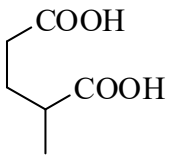
(d) 

19. Oxidation of X with chromic acid gives

(a) 

(b) 

(c) 

(d) 

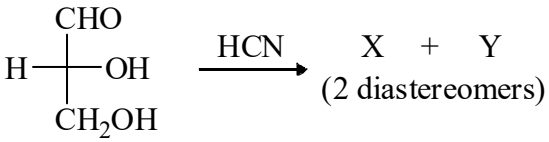
QUANTA CHEMISTRY CLASSES

GATE 2008

20. Cyanogen bromide (CNBr) specifically hydrolyses the peptide bond formed by the C – side of

(a) methionine (b) glycine (c) proline (d) serine

21. In the following reaction,



D – Glyceraldehyde

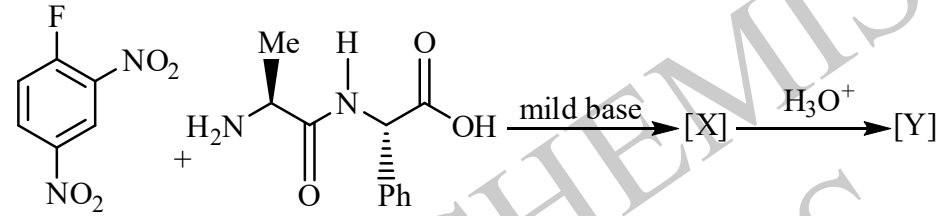
The absolute configurations of the chiral centres in X and Y are

(a) 2S, 3R and 2R, 3R (c) 2R, 3R and 2R, 3S

(c) 2S, 3S and 2R, 3R (d) 2S, 3R and 2S, 3R

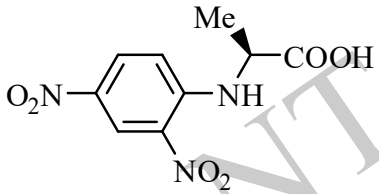
GATE 2009

22. In the two steps reaction sequence:

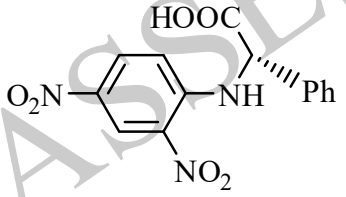


the major product Y is:

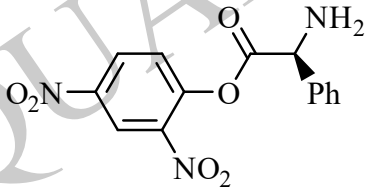
(a)



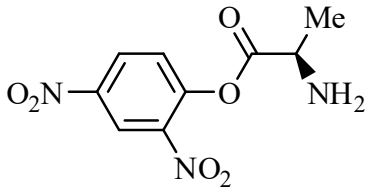
(b)



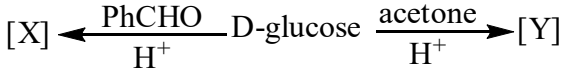
(c)



(d)

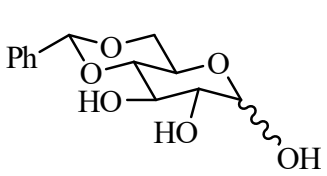


23. In the reactions,

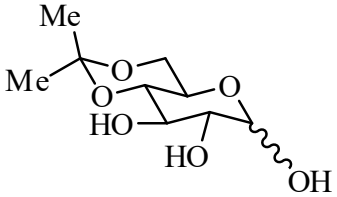


The major products X and Y, respectively are

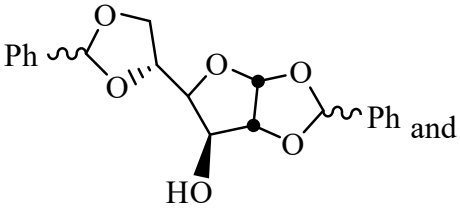
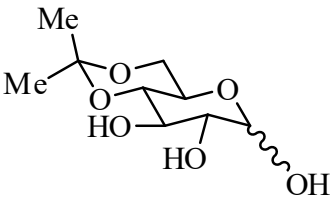
(a)

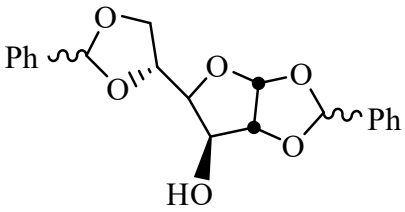
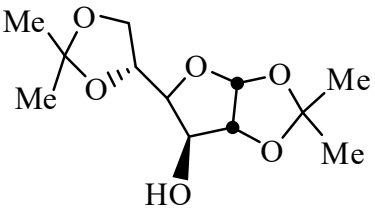


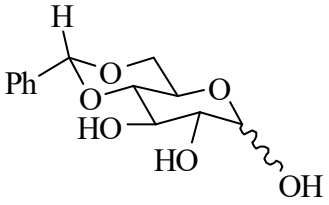
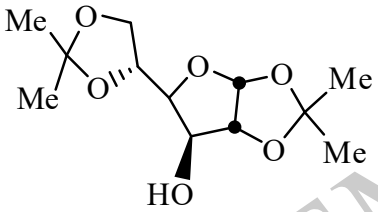
and



QUANTA CHEMISTRY CLASSES

(b)  and 

(c)  and 

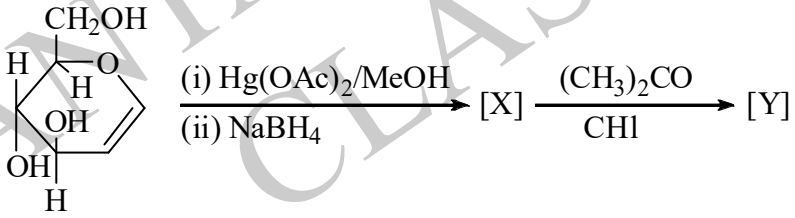
(d)  and 

GATE 2010

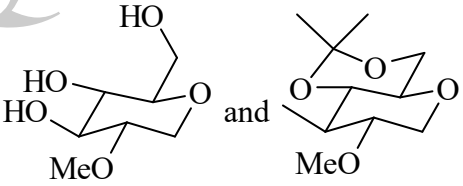
24. The decreasing order of isoelectric point for the following α – amino acids is

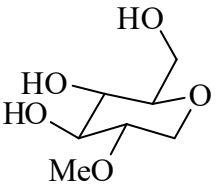
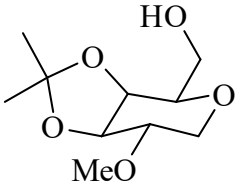
Lysine	Alanine	Glutamic acid	
(I)	(II)	(III)	
(a) I > II > III	(b) II > I > III	(c) III > I > II	(d) I > III > II

25. In the reaction sequence



the major products, [X] and [Y] respectively, are

(a)  and

(b)  and 

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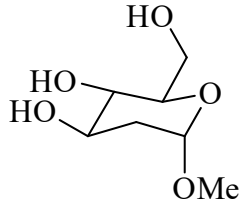
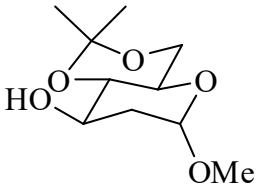
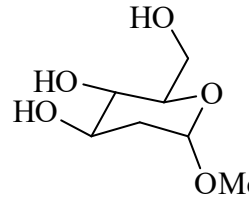
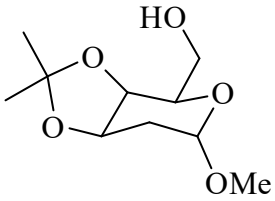
(c)  and 

(d)  and 

GATE 2011

26. The sequence of an mRNA molecule produced from a DNA template strand with the composition 5'–AGCTACACT–3' is

(a) 5'–AGUGUAGCU–3' (b) 5'–UCGAUGUGA–3'

(c) 5'–AGTGTAGCT–3' (d) 5'–TCGATGTGA–3'

GATE 2012

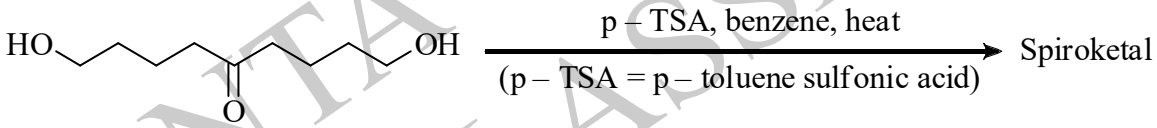
27. Number of thymine residues in a 5000 kb DNA containing 23% guanine residues is:

(a) 2.70×10^6 (b) 2.70×10^7 (c) 1.35×10^6 (d) 1.35×10^7

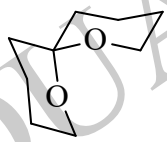
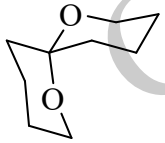
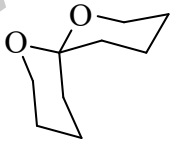
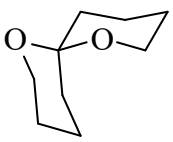
28. A disaccharide that will not given Benedict's test and will not form osazone is

(a) maltose (b) lactose (c) cellobiose (d) sucrose

29. The acid catalyzed cyclization of 5 – ketodecan – 1, 9 – diol is given below

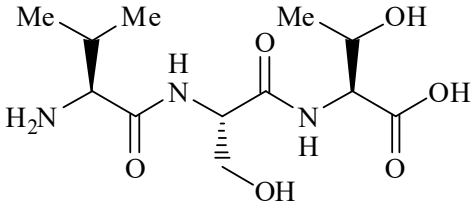


The most predominant sprioketal is

(a)  (b)  (c)  (d) 

GATE 2013

30. The correct sequence of the amino acids present in the tripeptide given below is

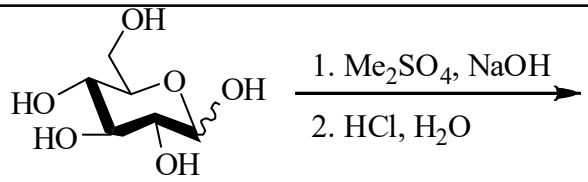


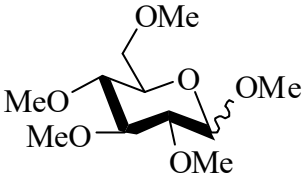
(a) Val – Ser – Thr (b) Val – Thr – Ser (c) Leu – Ser – Thr (d) Leu – Thr – Ser

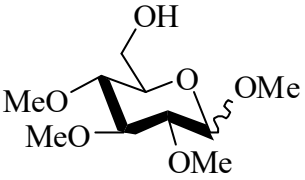
GATE 2014

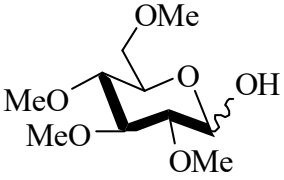
31. The major product of the following reaction is

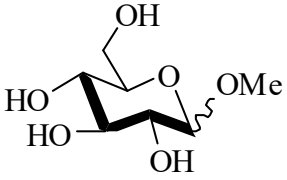
QUANTA CHEMISTRY CLASSES



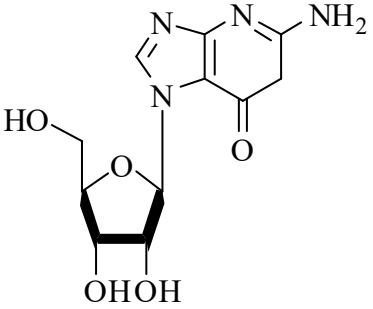
(a) 

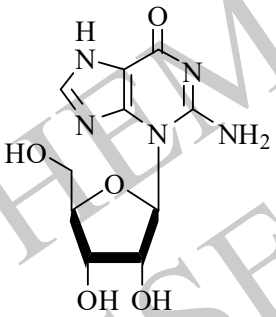
(b) 

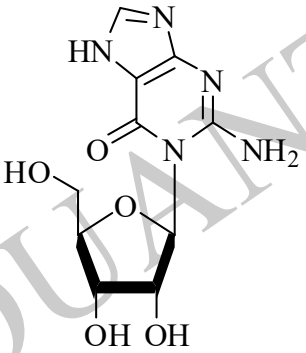
(c) 

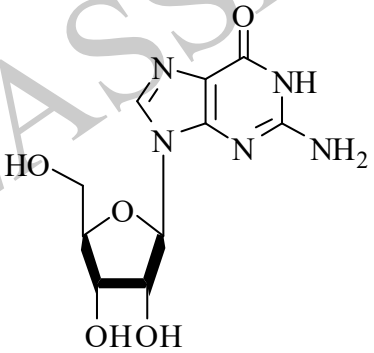
(d) 

32. Amongst the following, the structure of guanosine is

(a) 

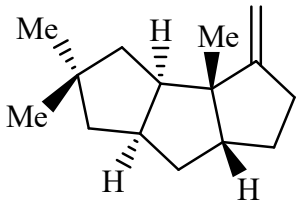
(b) 

(c) 

(d) 

GATE 2015

33. The compound given below is a



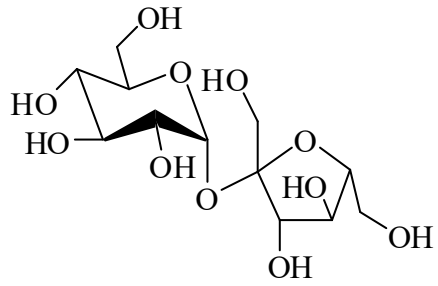
(Hirsutene)

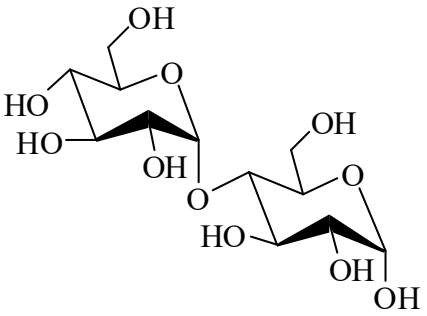
(a) sesterterpene (b) monoterpene (c) sesquiterpene (d) triterpene

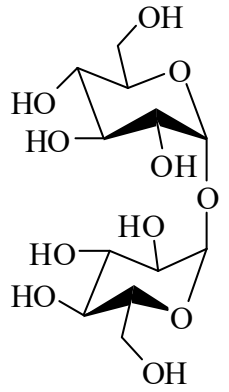
GATE 2016

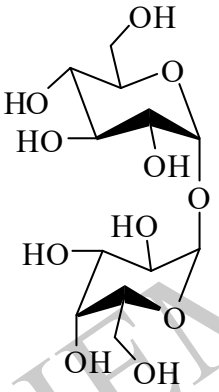
34. A disaccharide does NOT give a positive test for Tollen's reagent. Upon acidic hydrolysis, it gives an equimolar mixture of two different monosaccharides, both of which can be oxidized by bromine water. This disaccharide is

QUANTA CHEMISTRY CLASSES

(a) 

(b) 

(c) 

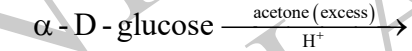
(d) 

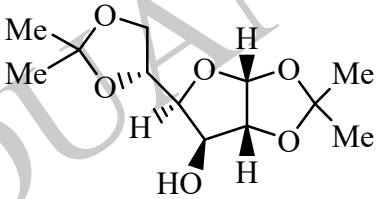
GATE 2019

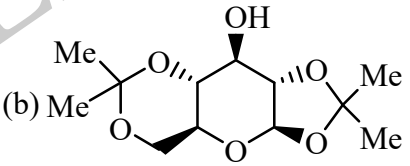
35. A tetrapeptide, made up of natural amino acids, has alanine as the N-terminal residue which is coupled to a chiral amino acid. Upon complete hydrolysis, the tetrapeptide gives glycine, alanine, phenylalanine and leucine. The number of possible sequences of the tetrapeptide is _____.

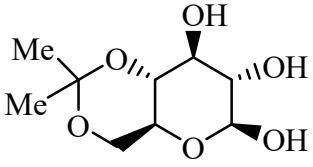
GATE 2020

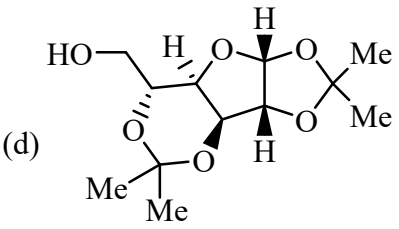
36. Major product formed in the given reaction is:



(a) 

(b) 

(c) 

(d) 

GATE 2021

37. A correct example of a nucleotide is:

(a) DNA
(b) adenosine monophosphate (AMP)
(c) RNA
(d) uridine

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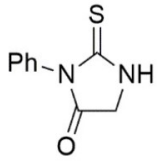
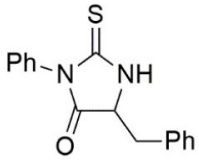
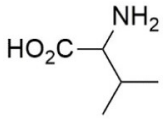
GATE 2022

38. A tripeptide on treatment with PhNCS (pH = 8.0) followed by heating with dilute HCl afforded a cyclic compound M and a dipeptide. The dipeptide on treatment with PhNCS (pH = 8.0) followed by heating with dilute HCl afforded a cyclic compound N and an acyclic compound O. The CORRECT sequence (from N- to C-terminus) of the tripeptide is

M = 

N = 

O = 

(a) glycine-phenylalanine-valine
(b) valine-phenylalanine-glycine
(c) glycine-tyrosine-valine
(d) glycine-phenylalanine-alanine

ANSWER KEY

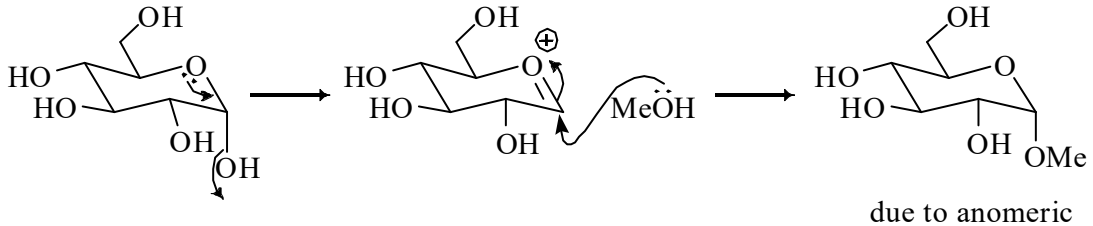
1.	(a)	2.	(*)	3.	(a)	4.	(*)	5.	(b)	6.	(*)	7.	(b)
8.	(a)	9.	(b)	10.	(c)	11.	(a)	12.	(b)	13.	(d)	14.	(a)
15.	(c)	16.	(b)	17.	(a)	18.	(*)	19.	(a)	20.	(a)	21.	(a)
22.	(*)	23.	(d)	24.	(a)	25.	(d)	26.	(c)	27.	(c)	28.	(d)
29.	(a)	30.	(a)	31.	(c)	32.	(d)	33.	(c)	34.	(d)	35.	(4)
36.	(a)	37.	(b)	38.	(a)								

(*) Hints & solution

QUANTA CHEMISTRY CLASSES

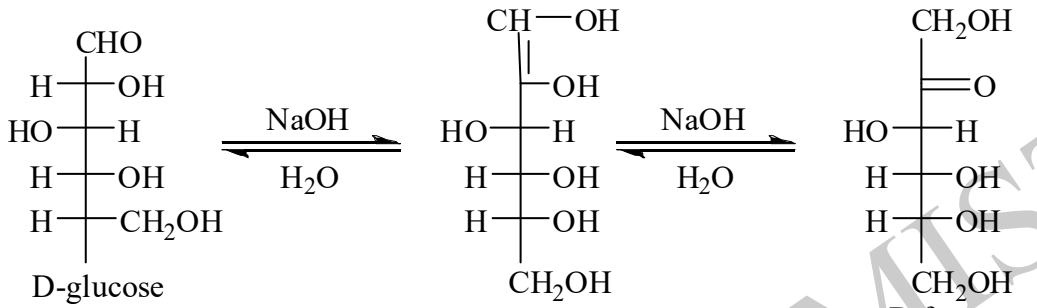
HINTS & SOLUTION

2.

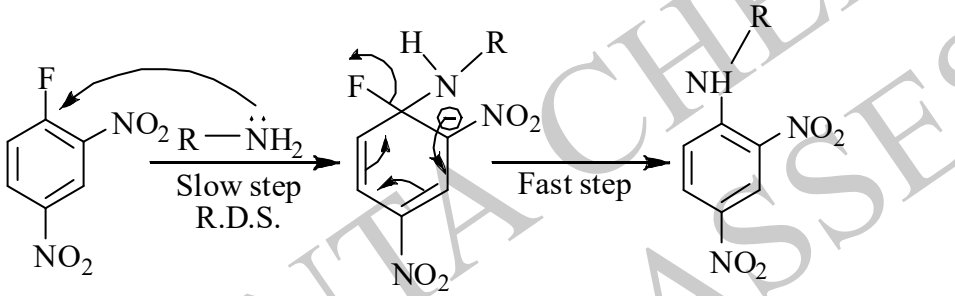


due to anomeric effect

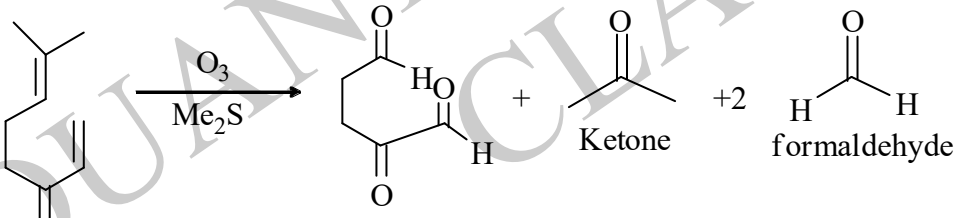
4.



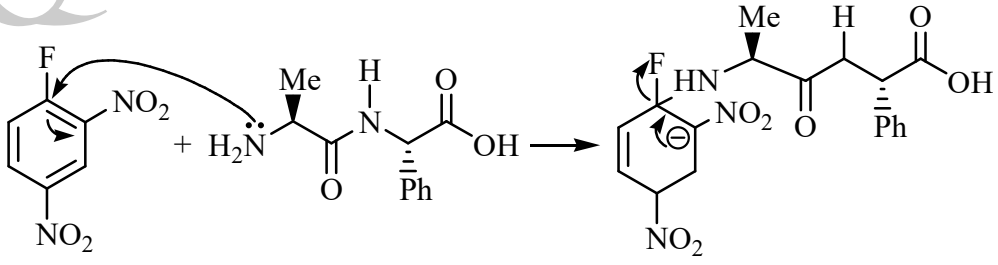
6. This reaction is an example of nucleophilic substitution and proceeds through addition eliminaton mechanism.

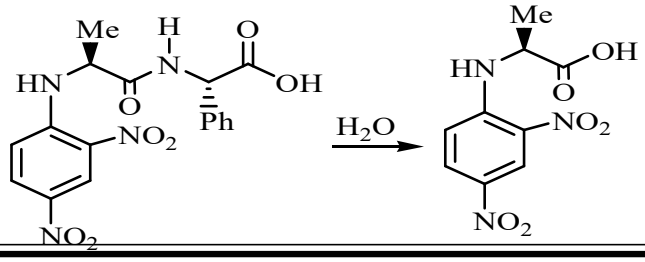


18.



22.





QUANTA CHEMISTRY CLASSES

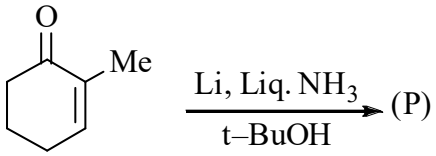
QUANTA CHEMISTRY CLASSES

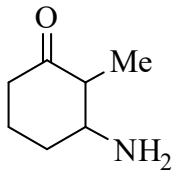
6

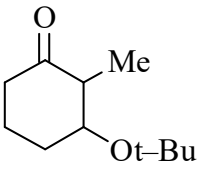
REAGENT

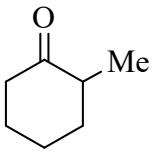
GATE-2005

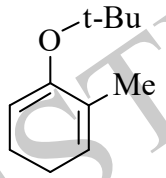
1. The major product P of the following reaction is



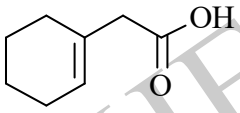
(a) 

(b) 

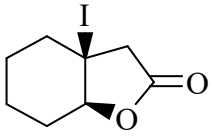
(c) 

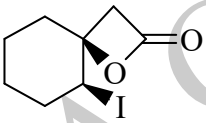
(d) 

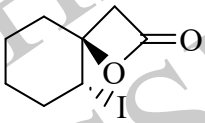
2. lodo – lactonization of β, γ – unsaturated carboxylic acid X with I_2 and $NaHCO_3$ gives

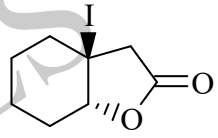


X

(a) 

(b) 

(c) 

(d) 

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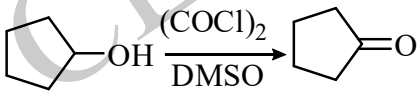
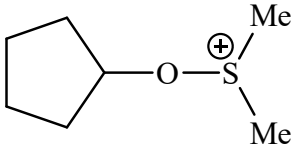
3. Which of the statement is CORRECT about the mechanism of the following reaction?



(a) DMSO react with alcohol initially to give 

, which reacts with $(COCl)_2$.

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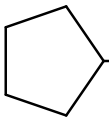
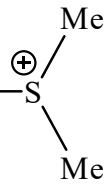
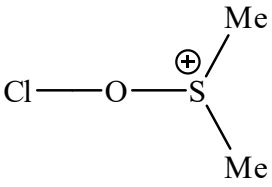
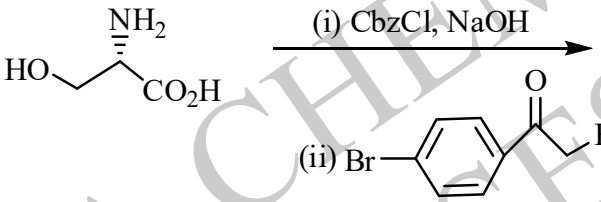
(b) $(COCl)_2$ reacts with the alcohol initially to give  , which reacts with DMSO

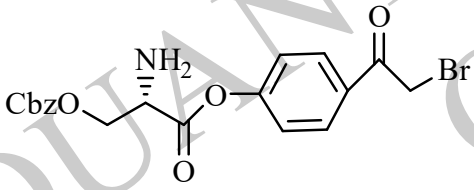
(c) DMSO reacts with $(COCl)_2$ initially to give  , which reacts with the alcohol.

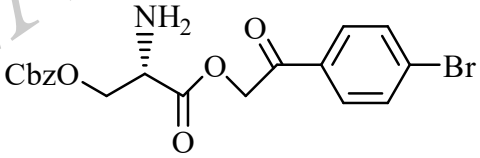
(d) $(COCl)_2$ react with DMSO initially to give  which reacts with the alcohol.

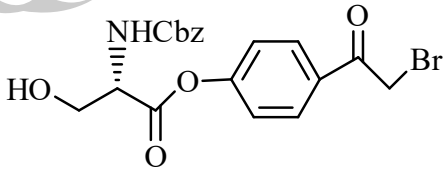
4. Pick the major product P in the following reaction

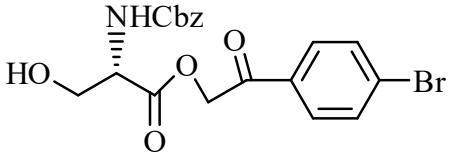


[CbzCl is $PhCH_2OCOCl$] $KHCO_3$, acetone, 40°C

(a) 

(b) 

(c) 

(d) 

5. Product P of the above reaction transforms to a product Q on treatment with n-Bu_3SnH in the presence of AIBN in benzene solution. Identify Q.

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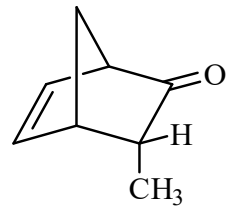
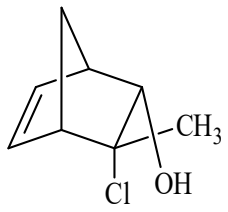
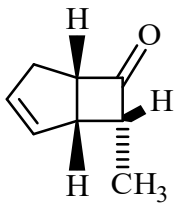
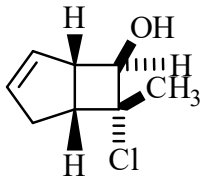
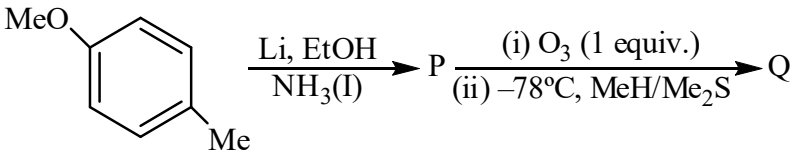
(a) 

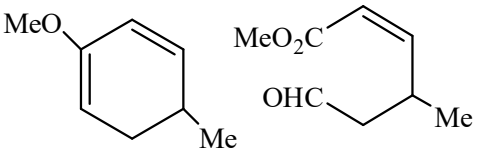
(b) 

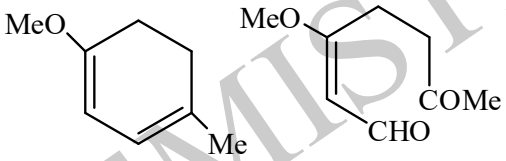
(c) 

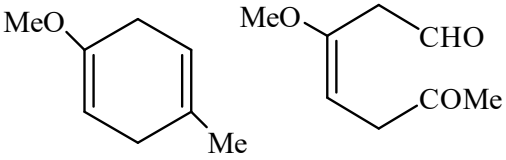
(d) 

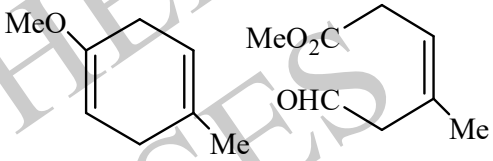
6. The prodcuts P and Q in the following sequence of reactions, respectively, are



(a) 

(b) 

(c) 

(d) 

7. The reagent for selective reduction of the aldehyde group in Q obtained in the above reaction is

(a) $H_2, (Ph_3P)_3\ RhCl$ (b) $((H_3C)_2\ CHCH_2)_2\ AlH$

(c) $Na(CH_3COO)_3\ BH$ (d) $LiAlH_4$

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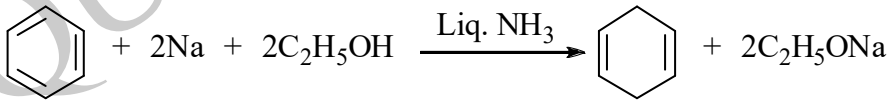
8. The reaction,



is an example of a

(a) Birch reduction (b) Clemmenson reduction

(c) Wolff – Kishner reduction (d) hydride reduction

9. The result of the reduction of either (R) or (S) 2 – methylcyclohexanone, in separate reactions, using $LiAlH_4$ is that the reduction of

(a) The R enantiomer is stereoselective (b) The R enantiomer is stereospecific

(c) The S enantiomer is stereospecific (d) Both the R and S enantiomers is stereoselective

10. In the reaction,

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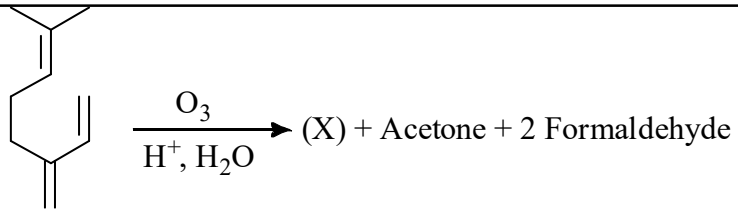
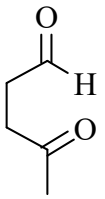
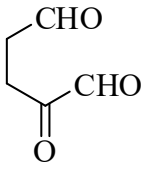
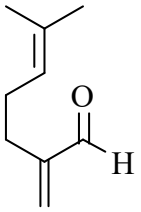
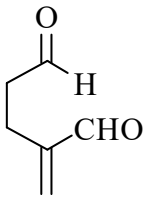


Compound X is

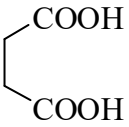
(a) 

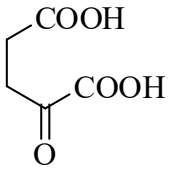
(b) 

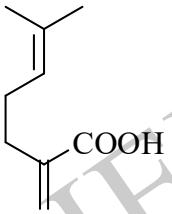
(c) 

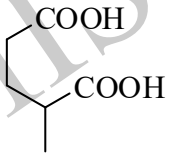
(d) 

11. Oxidation of X with chromic acid chiefly gives

(a) 

(b) 

(c) 

(d) 

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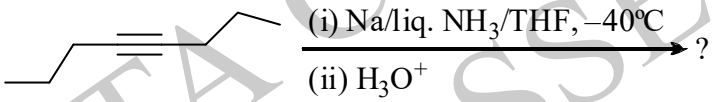
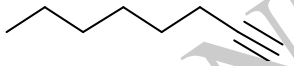
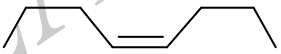
12. The major proeduct of the following reaction is



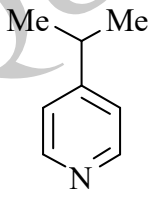
(a) 

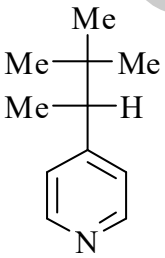
(b)

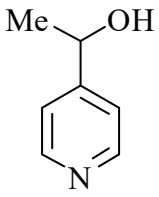
(c)

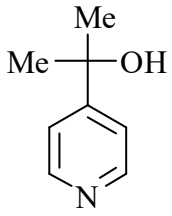
(d) 

13. The compound that is NOT oxidized by $KMnO_4$ is:

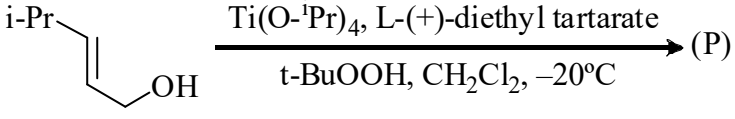
(a) 

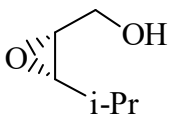
(b) 

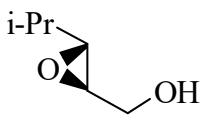
(c) 

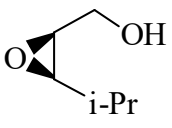
(d) 

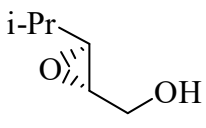
14. The major product of the following reaction is



(a) 

(b) 

(c) 

(d) 

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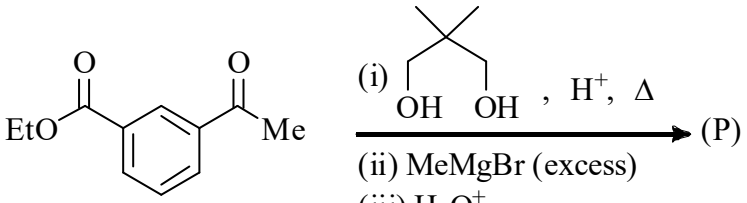
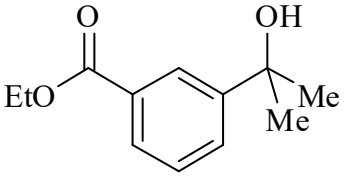
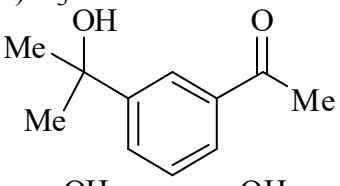
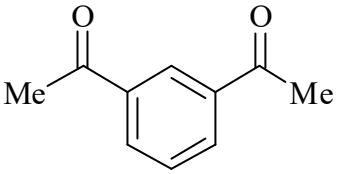
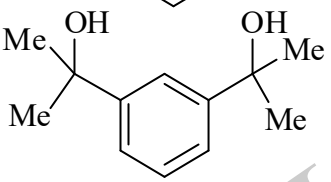
15. The major product P of the following reactions is



(a) 

(b) 

(c) 

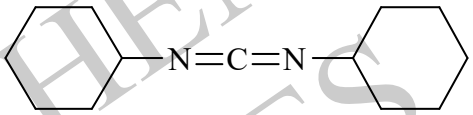
(d) 

16. The reagent X in the following reaction is

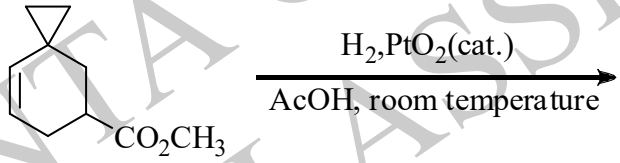
(a) $HO_2CN = NCO_2H$

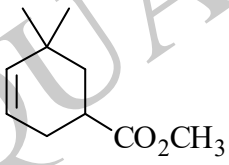
(b) $EtO_2CN = NC - CO_2Et$

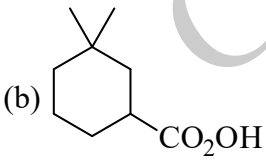
(c) $EtO_2CH = NCO_2Et$

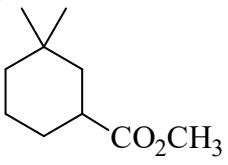
(d) 

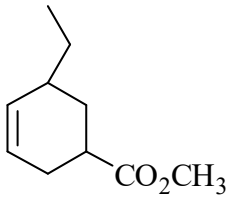
17. The major product of the following reaction is:



(a) 

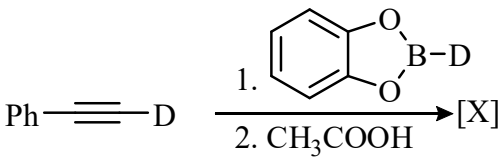
(b) 

(c) 

(d) 

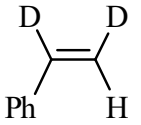
GATE-2009

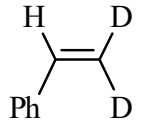
18. In the reaction

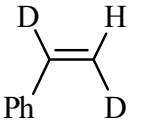


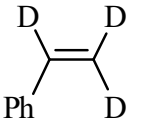
the major product X is

QUANTA CHEMISTRY CLASSES

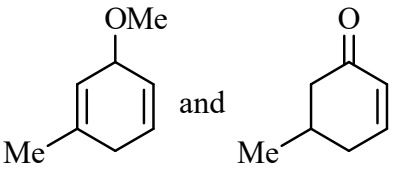
(a) 

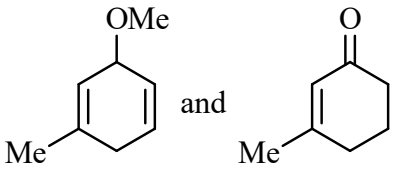
(b) 

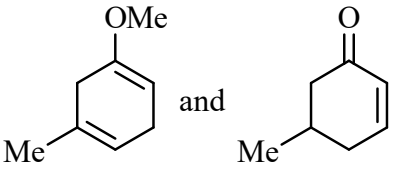
(c) 

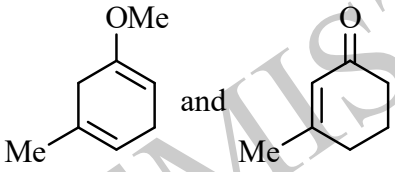
(d) 

19 eaction of m-menthylanisole with lithium in liquid ammonia and t-butyl alcohol at –33°C generates compound X as the major product. Treatment of the compound X with dilute sulphuric acid produces compound Y as the major product. The compounds X and Y, respectively, are

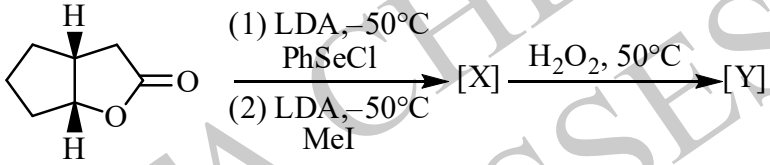
(a) 

(b) 

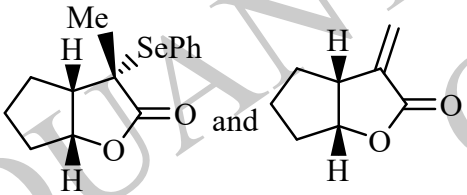
(c) 

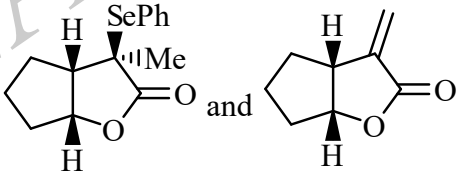
(d) 

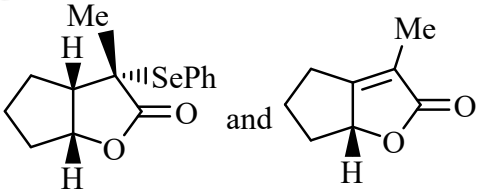
20. In the reaction sequence

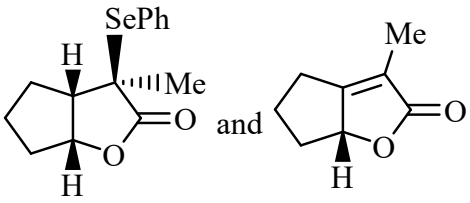


the major product respectively, are:

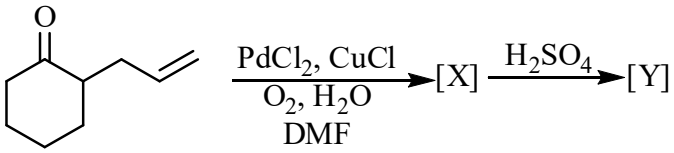
(a) 

(b) 

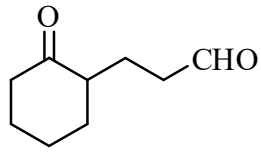
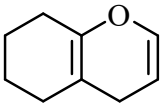
(c) 

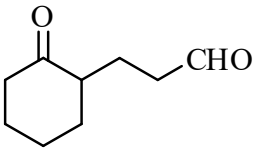
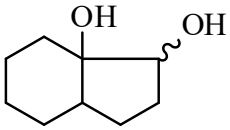
(d) 

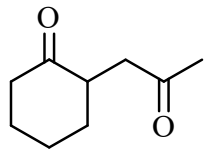
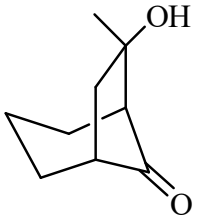
21. In the reaction sequence the major products X and Y, respectively are

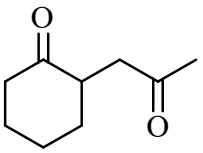
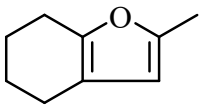


QUANTA CHEMISTRY CLASSES

(a)  and 

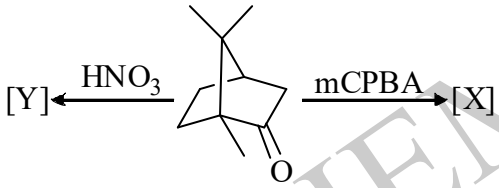
(b)  and 

(c)  and 

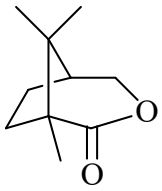
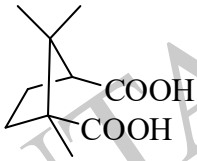
(d)  and 

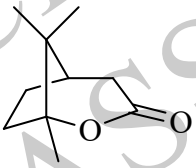
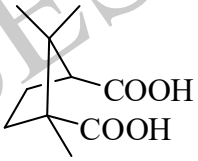
GATE-2010

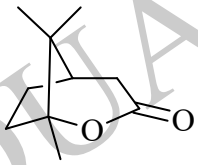
22. In the reaction,

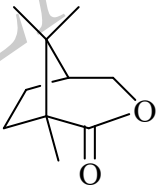
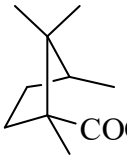


the major products, [X] and [Y], respectively, are

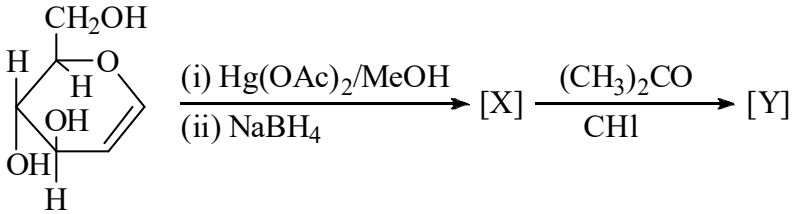
(a)  and 

(b)  and 

(c)  and

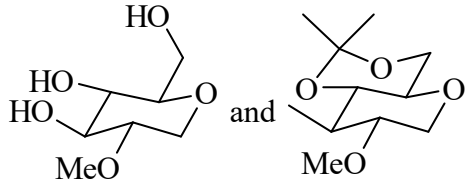
(d)  and 

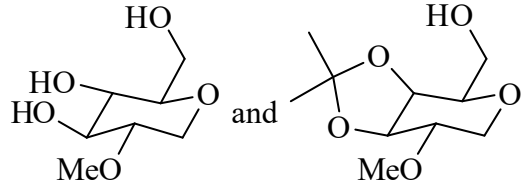
23. In the reaction sequence

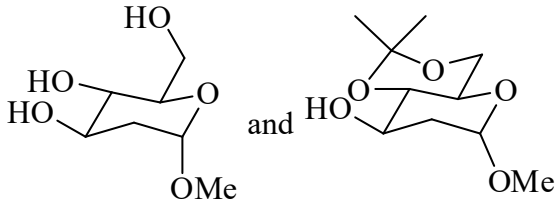


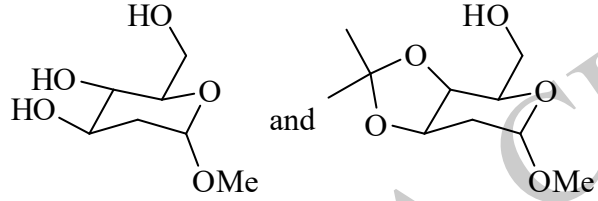
the major products, [X] and [Y] respectively, are

QUANTA CHEMISTRY CLASSES

(a)  and

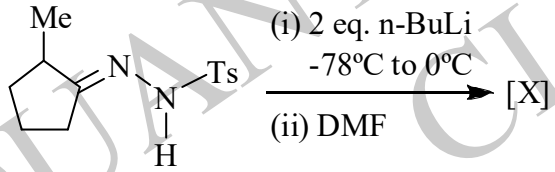
(b) 

(c) 

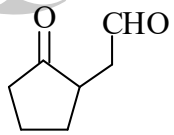
(d) 

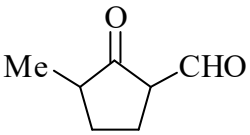
GATE-2011

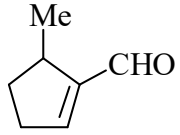
24. In the following reaction

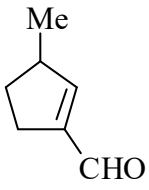


the major product [X] is:

(a) 

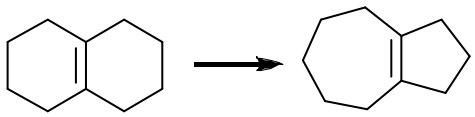
(b) 

(c) 

(d) 

QUANTA CHEMISTRY CLASSES

25. The mosjt appropriate sequence of reactions for carrying out the following conversion



is

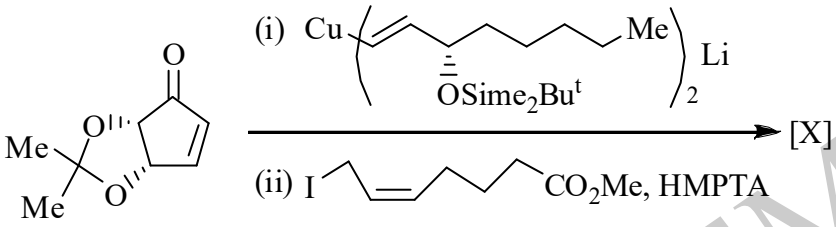
(a) (i) Peracid; (ii) H^+; (iii) Zn/dil. HCl

(b) (i) Alkaline $KMnO_4$; (ii) $NaIO_4$; (iii) N_2H_4/KOH

(c) (i) Alkaline $KMnO_4$; (ii) H^+; (iii) Zn/dil. HCl

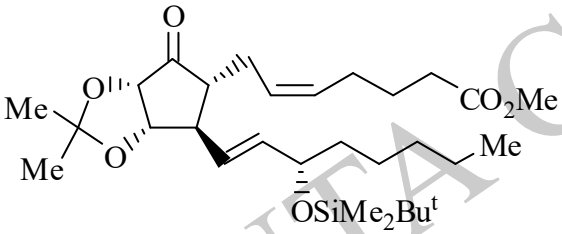
(d) (i) O_3/Me_2S; (ii) NaOEt; (iii) N_2H_4/KOH

26. In the following conversion

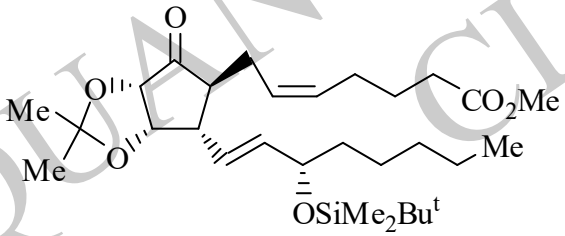


the major product [X] is:

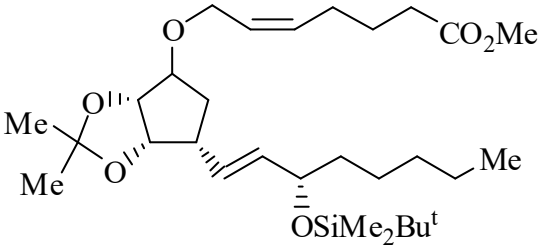
(a)



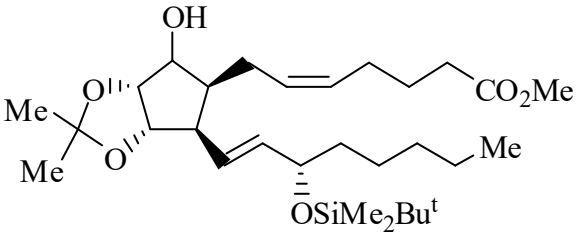
(b)



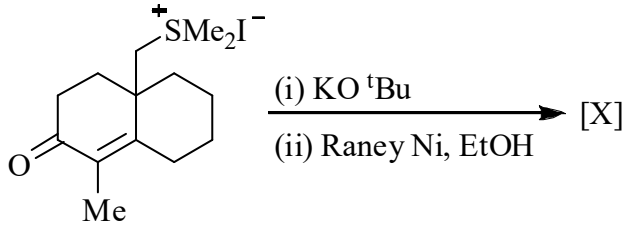
(c)



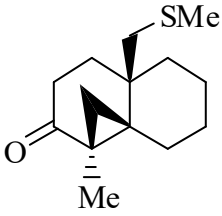
QUANTA CHEMISTRY CLASSES

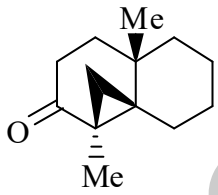
(d) 

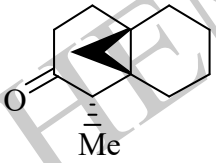
27. In the following reaction,

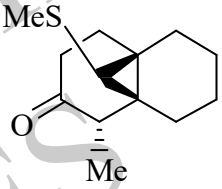


the major product [X] is:

(a) 

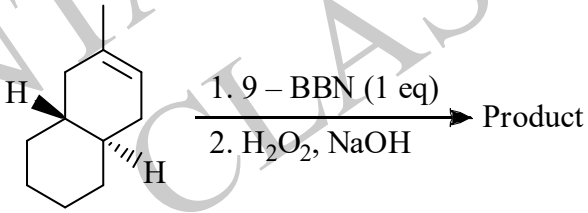
(b) 

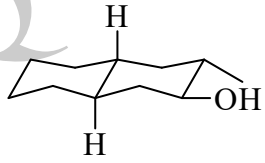
(c) 

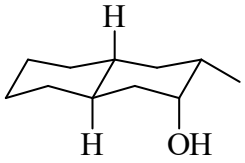
(d) 

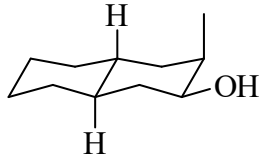
GATE-2012

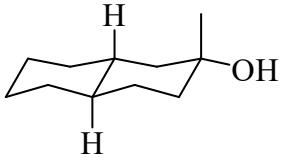
28. Identify the product from the following reaction



(a) 

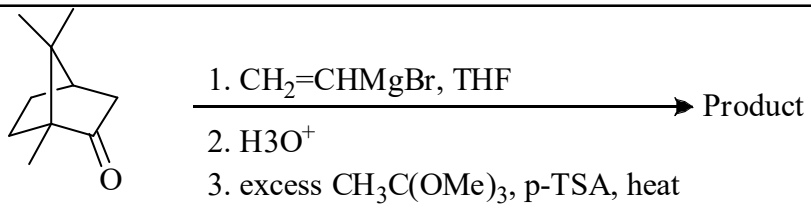
(b) 

(c) 

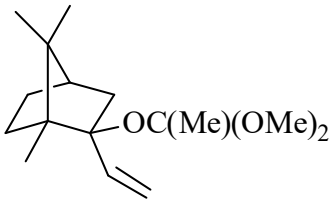
(d) 

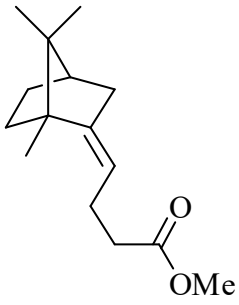
29. In the reaction given below, identify the product

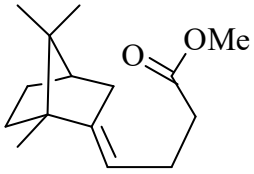
QUANTA CHEMISTRY CLASSES

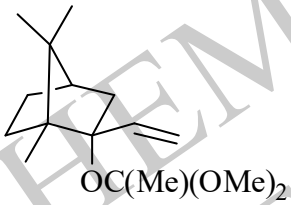


(p – TSA = p – toluenesulfonic acid; THF = tetrahydrofuran)

(a) 

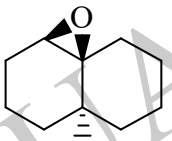
(b) 

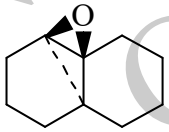
(c) 

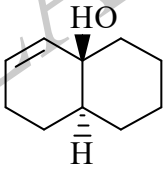
(d) 

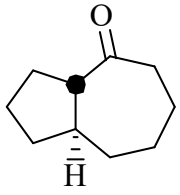
30. The oxidant X used in step 1 is
(a) CrO_3 (b) OsO_4
(c) $NaIO_4$ (d) m – CPBA followed by NaOH

31. The product is

(a) 

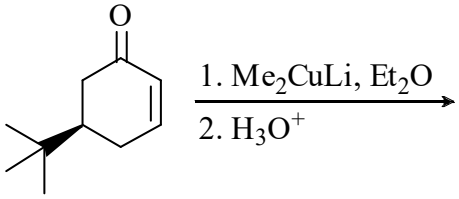
(b) 

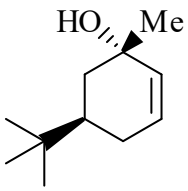
(c) 

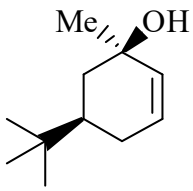
(d) 

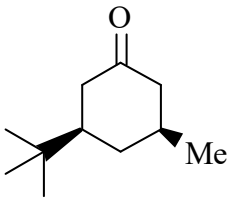
GATE-2013

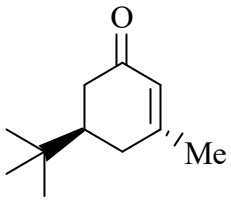
32. The major product formed in the reaction given below is:



(a) 

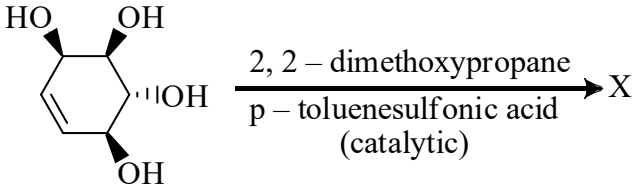
(b) 

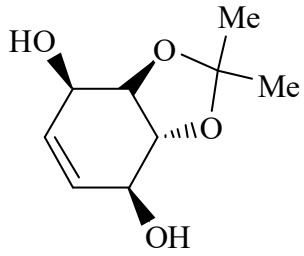
(c) 

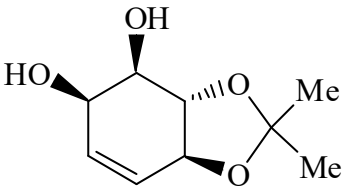
(d) 

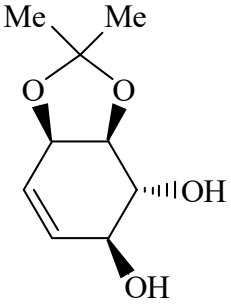
QUANTA CHEMISTRY CLASSES

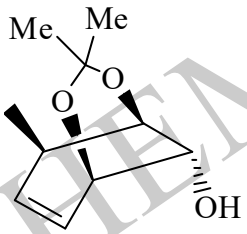
33. The major product X formed in the reaction given below is



(a) 

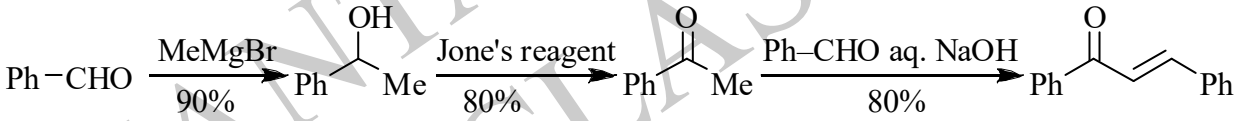
(b) 

(c) 

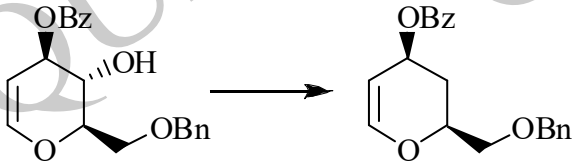
(d) 

GATE-2014

34. The overall yield (in %) for the following reaction sequence is _____



35. The most suitable reagent combination to effect the following conversion is



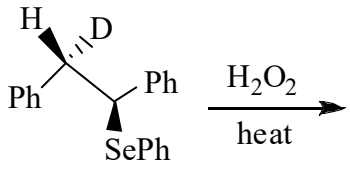
(a) (i) NaH, CS_2, then MeI; (ii) Bu_3SnH, AlBN, C_6H_6, Reflux

(b) (i) I_2, PPh_3, imidazole; (ii) H_2, 10% Pd-C, AcOH, high pressure

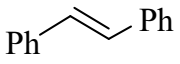
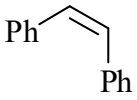
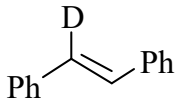
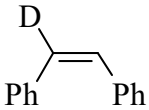
(c) (i) Me_3SiCl, pyridine, DMAP; (ii) Bu_3SnH, AlBN, C_6H_6, reflux

(d) (i) MsCl, pyridine, DMAP; (ii) $LiAlH_4$, THF, reflux

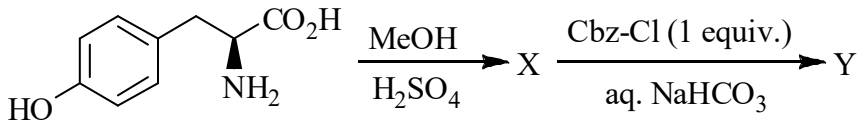
36. The major product formed in the following reaction is

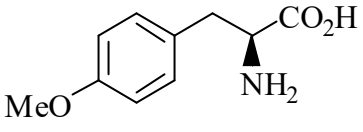
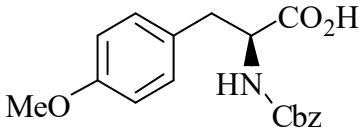


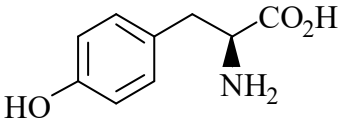
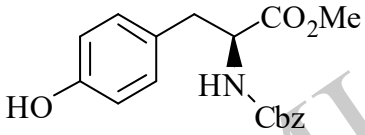
QUANTA CHEMISTRY CLASSES

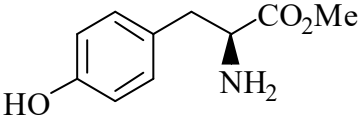
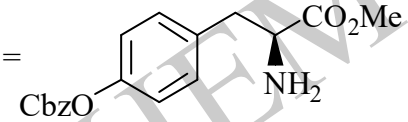
(a)  (b)  (c)  (d) 

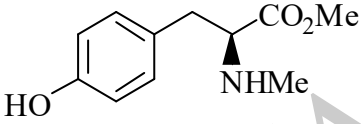
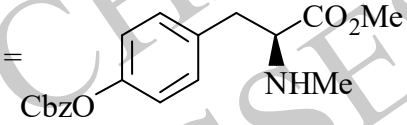
37. The major products X and Y formed in the following reaction sequence are



(a) X =  Y = 

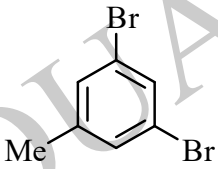
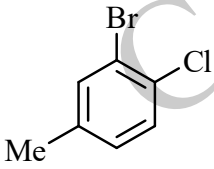
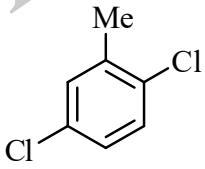
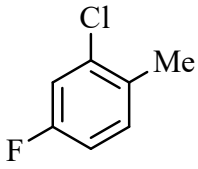
(b) X =  Y = 

(c) X =  Y = 

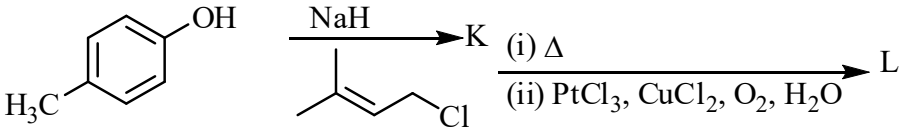
(d) X =  Y = 

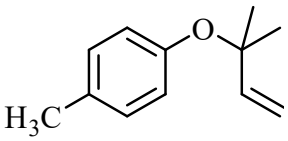
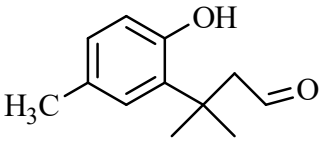
GATE-2015

38. The mass spectrum of a dihalo compound shows peaks with relative intensities of 1 : 2 : 1 corresponding to M, M + 2 and M + 4 (M is the mass of the molecular ion), respectively. The compound is

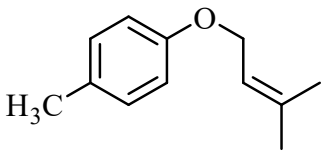
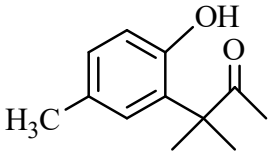
(a)  (b)  (c)  (d) 

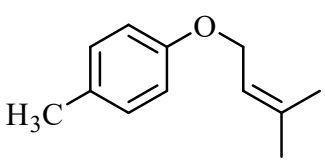
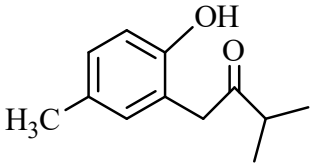
39. The major products, K and L formed in the following reactions are

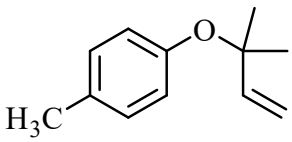
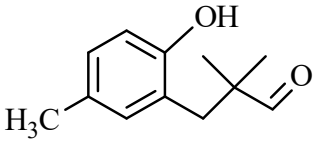


(a) K =  L = 

QUANTA CHEMISTRY CLASSES

(b) K =  L = 

(c) K =  L = 

(d) K =  L = 

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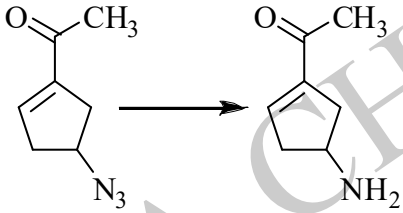
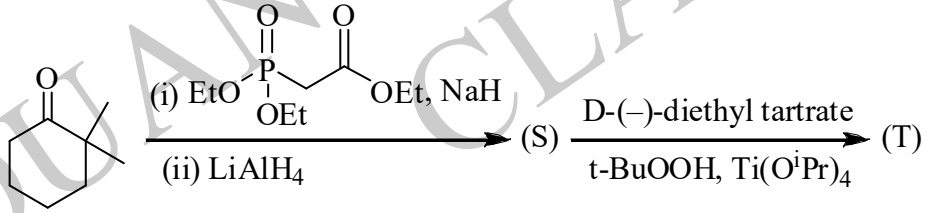
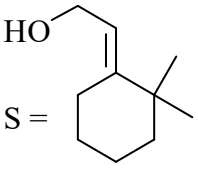
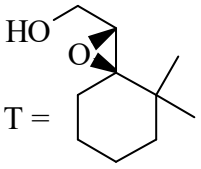
40. The most suitable reagent for performing the following transformation, is

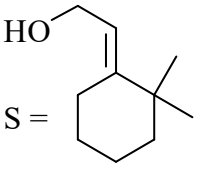
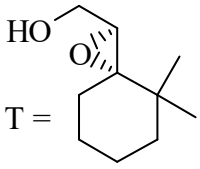


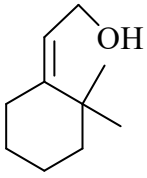
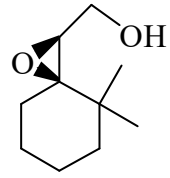
(a) $LiAlH_4$ (b) H_2, Pd/C (c) PPh_3, H_2O (d) Li, Liq. NH_3

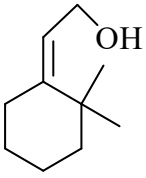
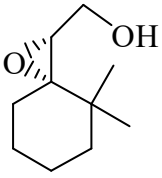
41. The major product S and T formed in the following synthetic schemem, are



(a) S =  T = 

(b) S =  T = 

(c) S =  T = 

(d) S =  T = 

42. Among the following, the transformation(s) that can be accomplished using umpolung concept is(are)

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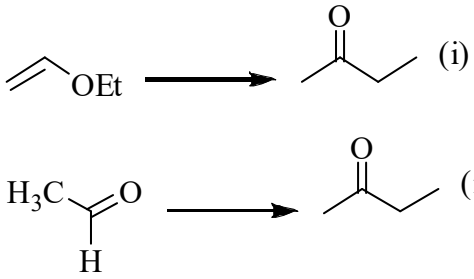
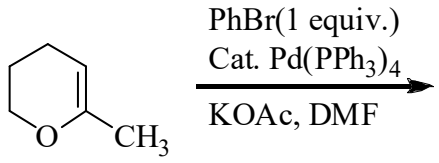
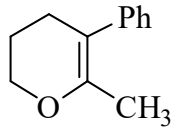


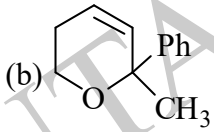
(Tr = trityl)

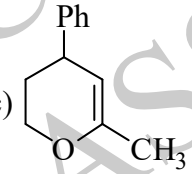
(a) (i) and (iii) (b) (ii) and (iv) (c) (ii) only (d) (i) and (ii)]

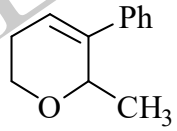
43. The major product formed in the following reaction, is



(a) 

(b) 

(c) 

(d) 

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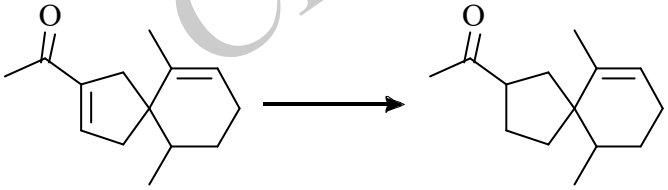
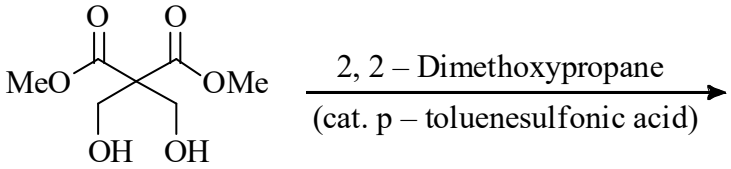
44. The most suitable reagenet for the following transformation is



(a) Li / Liq. NH_3 (b) PtO_2 / H_2 (c) $LiAlH_4$ (d) B_2H_6

45. The major product obtained in the following reaction is



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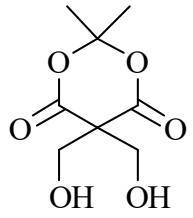
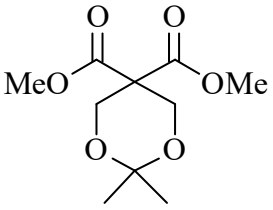
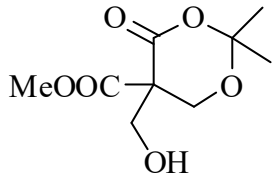
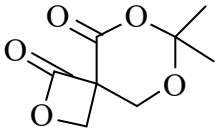
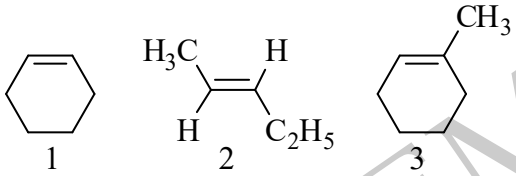
(a) 

(b) 

(c) 

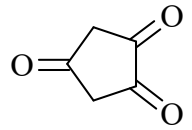
(d) 

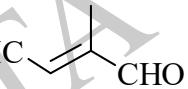
46. For the following three alkenes, 1, 2, and 3, the rates of hydrogeneation using Wilkinson's catalyst at 20°C vary in the order

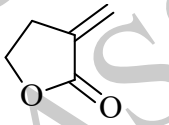


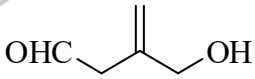
(a) 1 > 3 > 2 (b) 1 > 2 > 3 (c) 2 > 1 > 3 (d) 2 > 3 > 1

47. The major product formed in the following reaction is

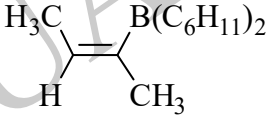
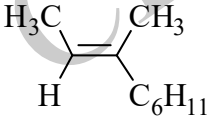
(a) 

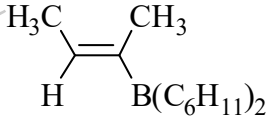
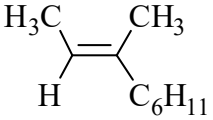
(b) 

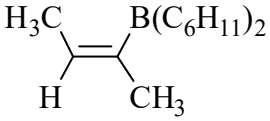
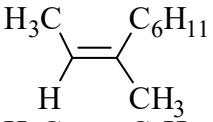
(c) 

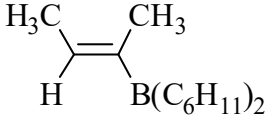
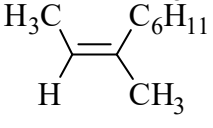
(d) 

48. Hydroboration of 2 – butyne with $(C_6H_{11})_2BH$ yields the intermediate U, which on treatment with I_2 and NaOMe at –78°C, gives product V. The structure of U and V are

(a) U =  V = 

(b) U =  V = 

(c) U =  V = 

(d)  V = 

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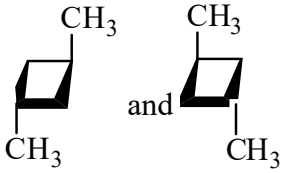
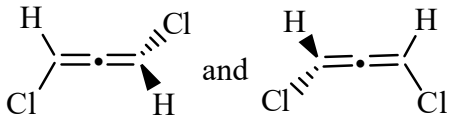
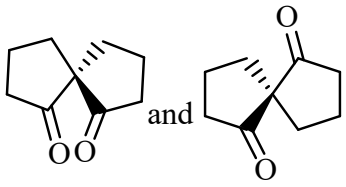
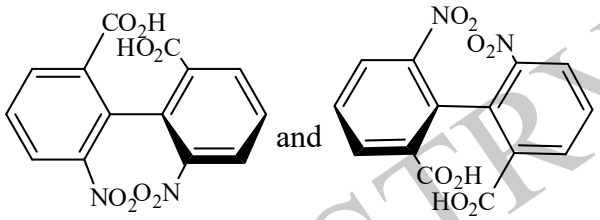
49. The enantiomeric pair, among the following is

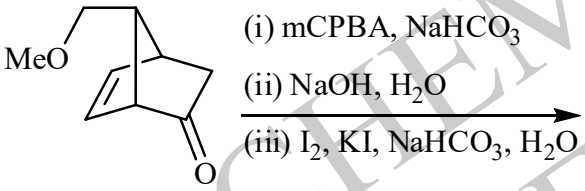
(a) 

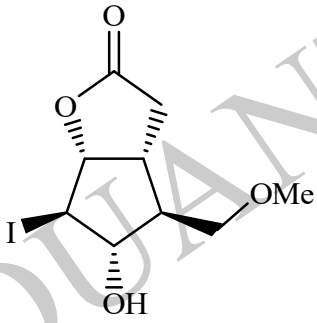
(b) 

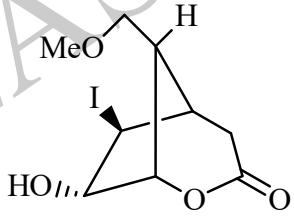
(c) 

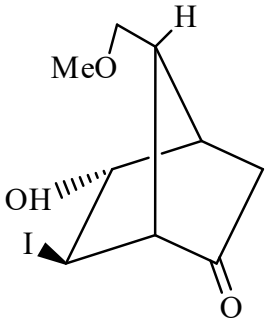
(d) 

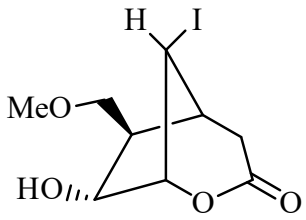
50. The major product in the following reaction sequence is



(a) 

(b) 

(c) 

(d) 

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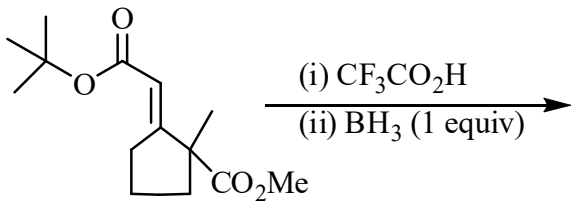
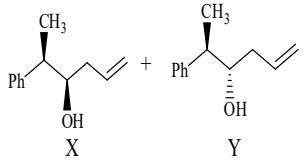
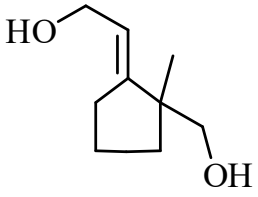
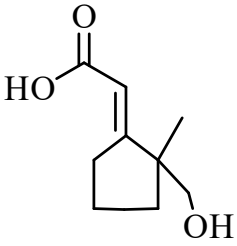
51. The major poduct formed in the following reaction sequence is

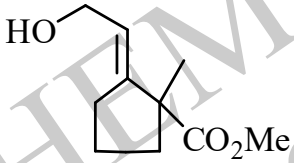


(a) 

X Y

(b) 

(c) 

(d) 

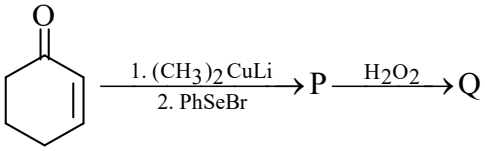
GATE-2019

52. Character table of point group D_8 is given below

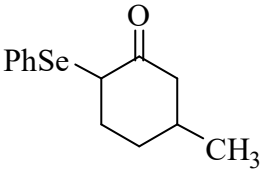
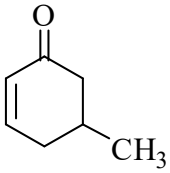
D_8	E	$2C_8$	$2C_4$	$2C_8^3$	C_2	$4C_2'$	$4C_2''$
A_1	a	1	1	1	1	1	1
A_2	b	1	1	1	1	h	i
B_1	c	−1	1	−1	1	1	j
B_2	d	−1	1	−1	1	−1	1
E_1	e	$\sqrt{2}$	0	$-\sqrt{2}$	−2	0	0
E_2	f	0	−2	0	k	0	0
E_3	g	$-\sqrt{2}$	0	$\sqrt{2}$	−2	0	0

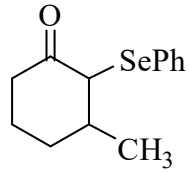
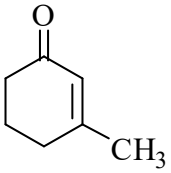
Value of (a + b + c + d + e + f + g + h + i + j + k) is equal to _____

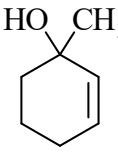
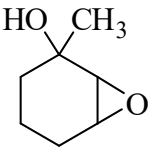
53. In the following reaction sequence, the products P and Q are

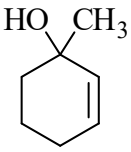
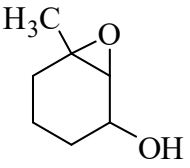


QUANTA CHEMISTRY CLASSES

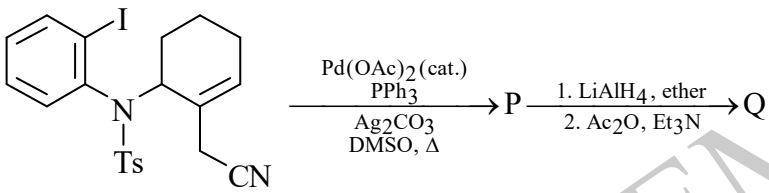
(a) P =  ; Q = 

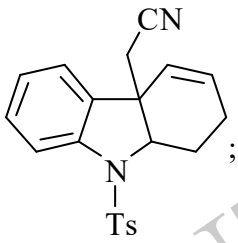
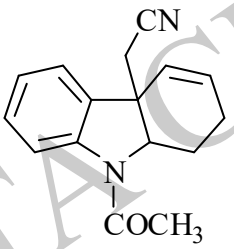
(b) P =  ; Q = 

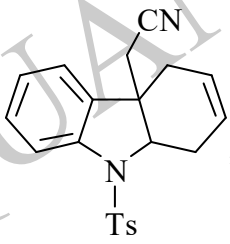
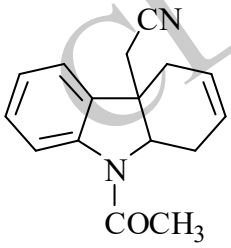
(c) P =  ; Q = 

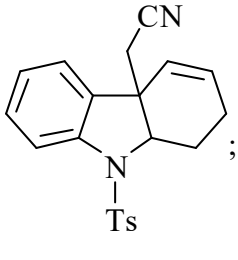
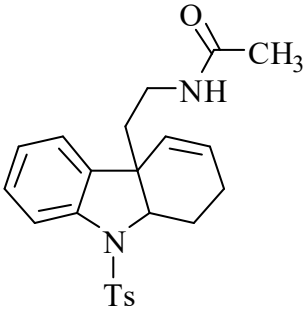
(d) P =  ; Q = 

54. In the following reaction sequence, the products P and Q are

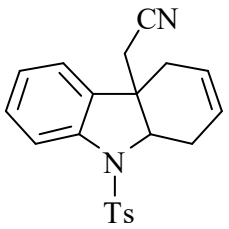
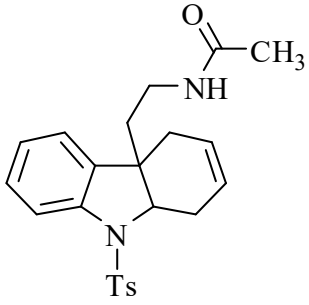


(a) P =  ; Q = 

(b) P =  ; Q = 

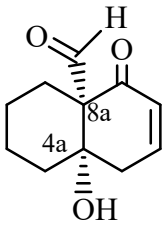
(c) P =  ; Q = 

QUANTA CHEMISTRY CLASSES

(d) P =  ; Q = 

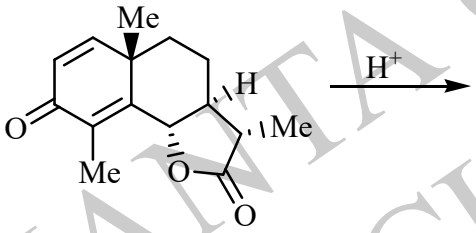
GATE-2020

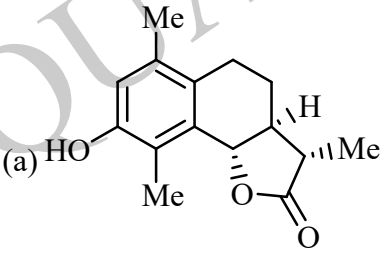
55. Absolute stereochemistry of the given compound is:

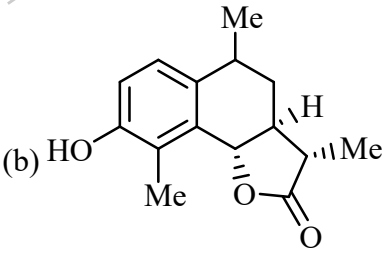


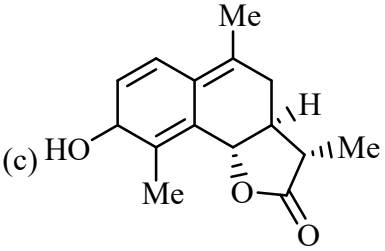
(a) 4aS, 8aR (b) raR, 8aS (c) 4aS, 8aS (d) 4aR, 8aR

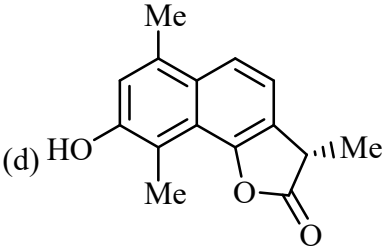
56. Major product formed in the following reaction is:



(a) 

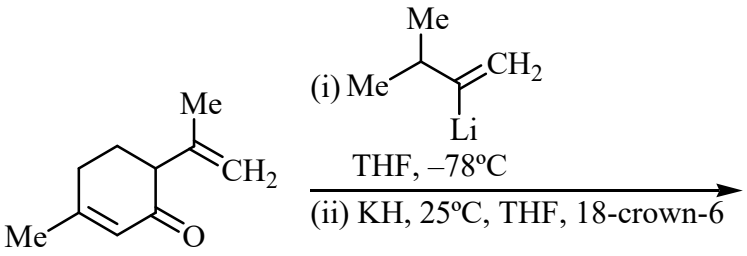
(b) 

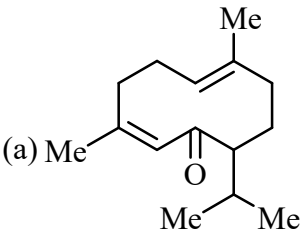
(c) 

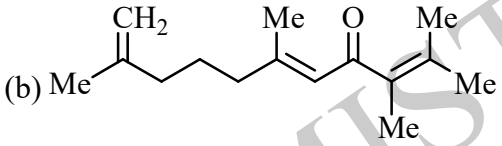
(d) 

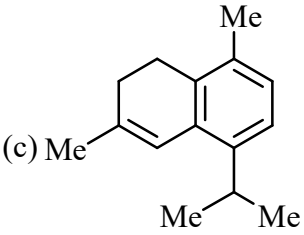
QUANTA CHEMISTRY CLASSES

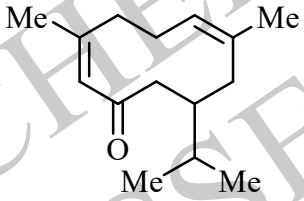
57. Major product formed in the following synthetic sequence is:



(a)


(b)


(c)


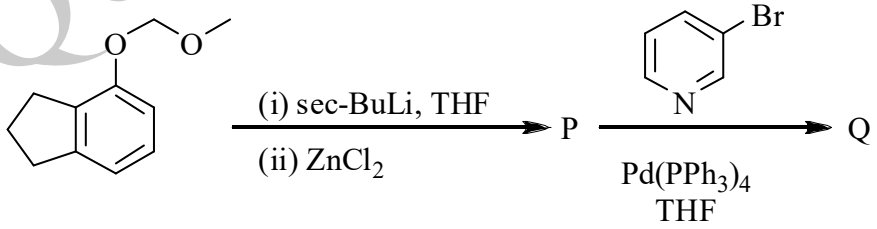
(d)


GATE-2021

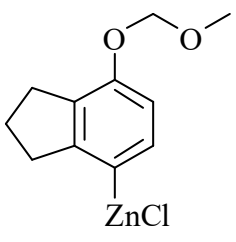
58. In a company, 35% of the employees drink coffee, 40% of the employees drink tea and 10% of the employees drink both and coffee. What % of employees drink neither tea nor coffee?

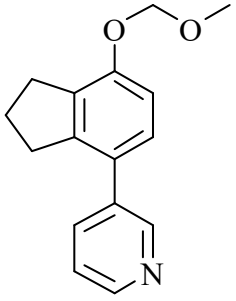
(a) 35 (b) 25 (c) 15 (d) 40

59. In the following reaction sequence

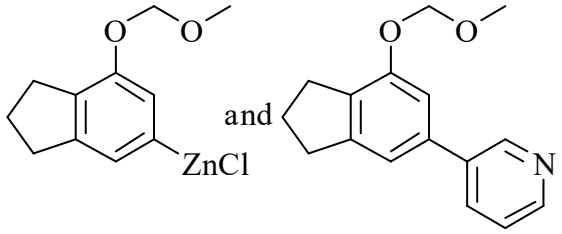


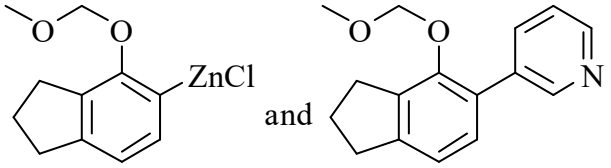
the major products P and Q, respectively, are:

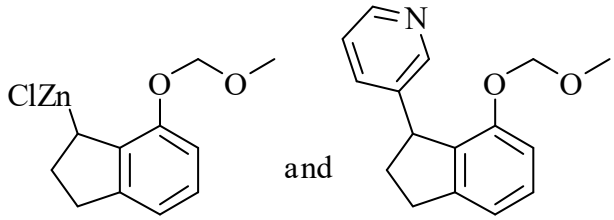
(a)


and


QUANTA CHEMISTRY CLASSES

(b) 

(c) 

(d) 

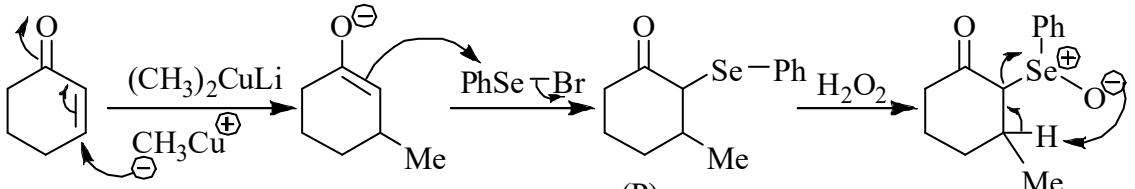
ANSWER KEY

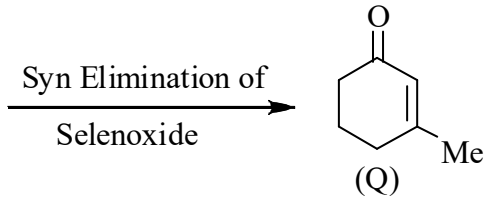
1.	(c)	2.	(d)	3.	(c)	4.	(d)	5.	(c)	6.	(d)	7.	(c)
8.	(a)	9.	(d)	10.	(b)	11.	(a)	12.	(c)	13.	(d)	14.	(d)
15.	(b)	16.	(d)	17.	(c)	18.	(c)	19.	(d)	20.	(a)	21.	(c)
22.	(b)	23.	(c)	24.	(c)	25.	(d)	26.	(a)	27.	(b)	28.	(a)
29.	(c)	30.	(b)	31.	(d)	32.	(d)	33.	(c)	34.	(57.6)	35.	(a)
36.	(c)	37.	(b)	38.	(a)	39.	(b)	40.	(c)	41.	(a)	42	(d)
43.	(b)	44.	(a)	45.	(b)	46.	(b)	47.	(c)	48.	(d)	49.	(d)
50.	(a)	51.	(d)	52.	(9)	53.	(*)	54.	(*)	55.	(*)	56.	(*)
57.	(a)	58	(*)	59.	(C)								

QUANTA CHEMISTRY CLASSES

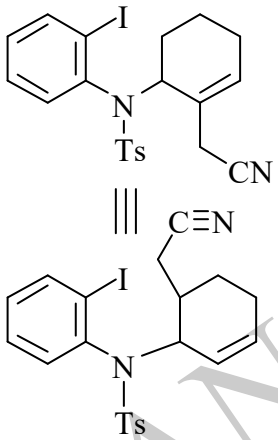
HINTS & SOLUTION

53Sol.

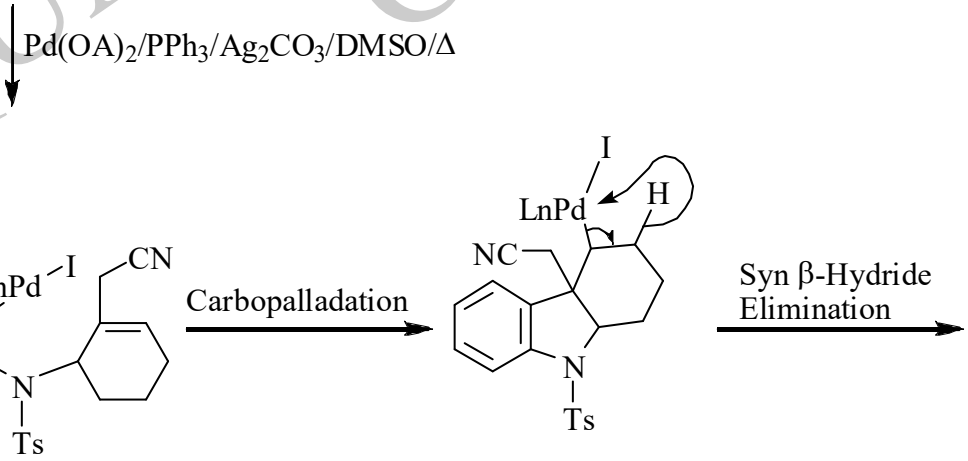




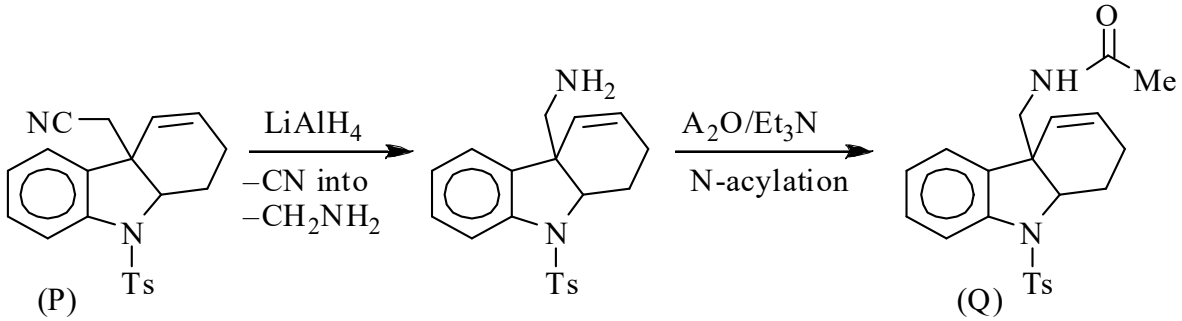
54. 4Sol.



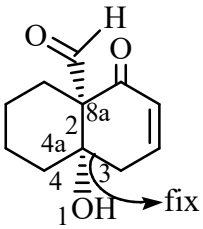
Intramoleculer Heck coupling with isomerigation of double bond



QUANTA CHEMISTRY CLASSES



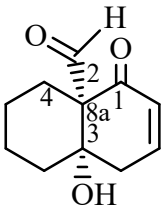
55Sol.:



Fix 3rd priority and rotate 1, 2 and 3.

$1 \rightarrow 2 \rightarrow 3$ (anticlockwise)

So, configuration of 4a centre is S.

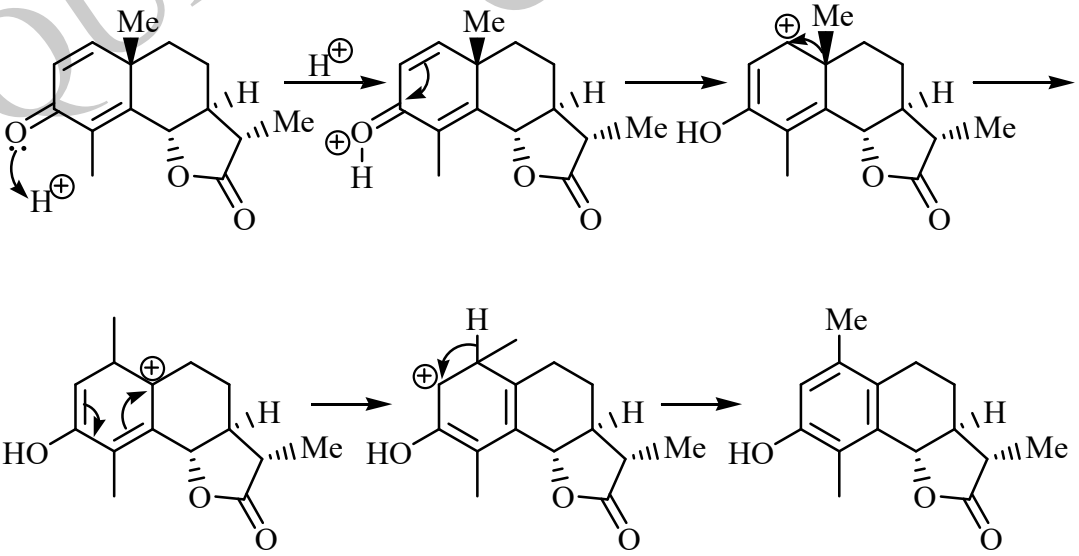


Similarly, here fix Ist priority and rotate 2, 3, 4

then rotate $1 \rightarrow 2 \rightarrow 3$ (clockwise)

So, configuration of 8a centre is R.

56Sol.:



QUANTA CHEMISTRY CLASSES

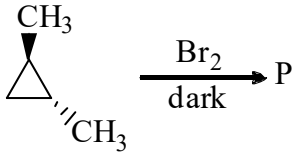
QUANTA CHEMISTRY CLASSES

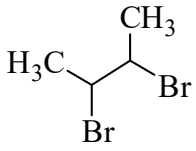
7

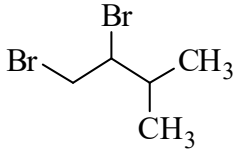
INTERMEDIATE

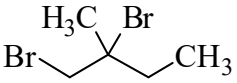
GATE-2005

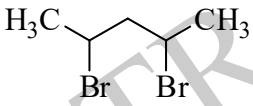
1. The major product P of the following reaction is:



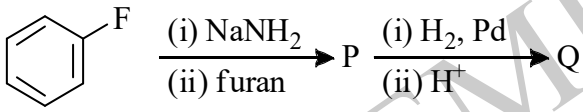
(a) 

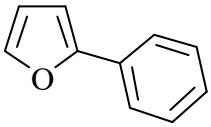
(b) 

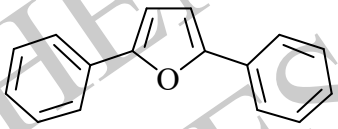
(c) 

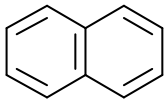
(d) 

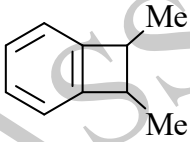
2.(a) In the following sequence of reactions, the major prdocudt Q is:



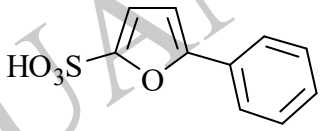
(a) 

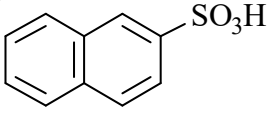
(b) 

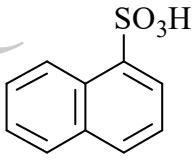
(c) 

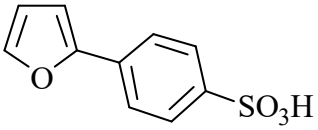
(d) 

2.(b) The major product on sulphonation of Q with H_2SO_4 at 160°C is:

(a) 

(b) 

(c) 

(d) 

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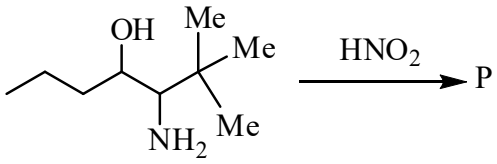
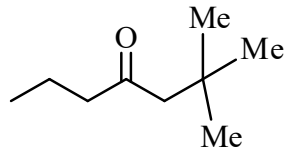
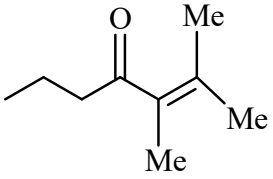
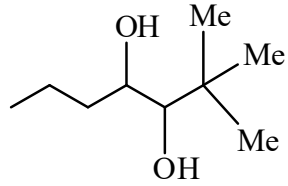
3. Predict the major product P in the following reaction

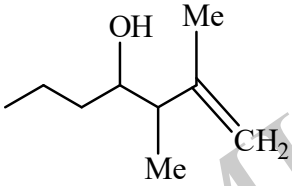
QUANTA CHEMISTRY CLASSES



(a) 

(b) 

(c) 

(d) 

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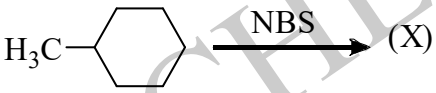
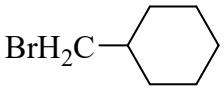
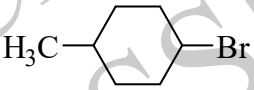
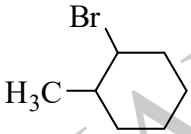
4. The major product (X) of the monobromination reaction is



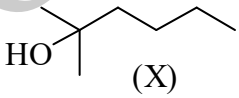
(a) 

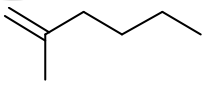
(b) 

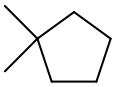
(c) 

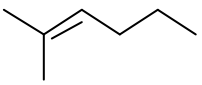
(d)

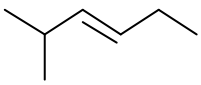
5. The major product obtained upon treatment of compound X with H_2SO_4 at 80°C is:



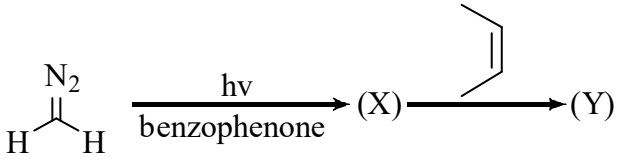
(a) 

(b) 

(c) 

(d) 

6. In the following reaction,



(X) and (Y) respectively are

(a) ^{1}: CH_2 and cis 1, 2 – dimethylcyclopropane

(b) ^{3}: CH_2 and cis 1, 2 – dimethylcyclopropane

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(c) ^{1}: CH_2 and a mixture of cis / trans 1, 2 – dimethylcyclopropane

(d) ^{3}: CH_2 and a mixture of cis / trans 1, 2 – dimethylcyclopropane

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7. In the carbylamine reaction, R – X is converted to R – Y via the intermediate Z. R – X, R – Y and Z, respectively, are

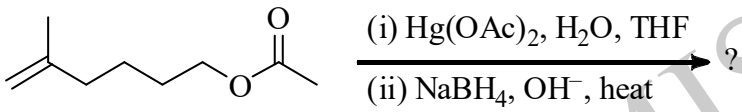
(a) R – NH_2, R – NC, carbene (b) R – NH_2, R – NC, nitrene

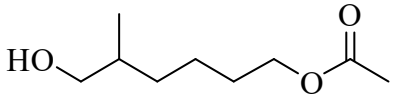
(c) R – NC, R – NH_2, carbene (d) R – OH, R – NC, nitrene

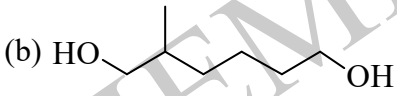
8. The photochemical reaction of 2 – methylpropane with F_2 gives 2 – fluoro – 2 – methylpropane and 1 – fluoro – 2 – methylpropane in 14:86 ratio. The corresponding ratio of the bromo products in the above reaction using Br_2 is most likely to be

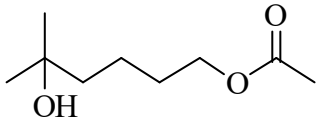
(a) 14 : 86 (b) 50 : 50 (c) 1 : 9 (d) 99 : 1

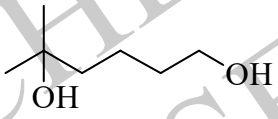
9. The major product of the following reaction is



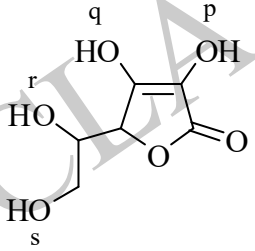
(a) 

(b) 

(c) 

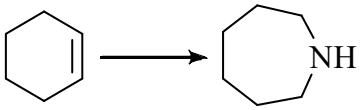
(d) 

10. In the following compound, the hydroxy group that is most readily methylated with CH_2N_2 is:



(a) p (b) q (c) r (d) s

11. The most appropriate sequence of reactions for carrying out the following transformation.



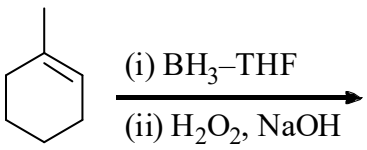
(a) (i) O_3/H_2O_2; (ii) excess $SOCl_2$/pyridine; (iii) excess NH_3; (iv) $LiAlH_4$

(b) (i) O_3/Me_2S; (ii) excess $SOCl_2$/pyridine; (iii) $LiAlH_4$; (iv) excess NH_3

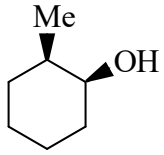
(c) (i) O_3/H_2O_2; (ii) excess $SOCl_2$/pyridine; (iii) $LiAlH_4$; (iv) excess NH_3

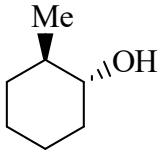
(d) (i) O_3/Me_2S; (ii) excess $SOCl_2$/pyridine; (iii) excess NH_3; (iv) $LiAlH_4$

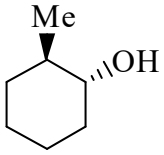
12. The major product of the following reaction is

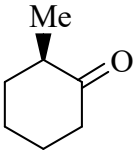


QUANTA CHEMISTRY CLASSES

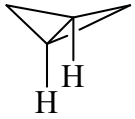
(a) 

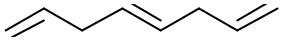
(b) 

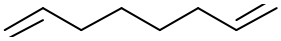
(c) 

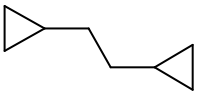
(d) 

13. The reactive intermediate I and the product P are

(a) carbene and 

(b) radical and 

(c) carbene and 

(d) radical and 

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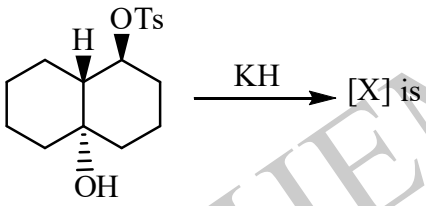
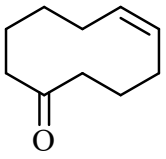
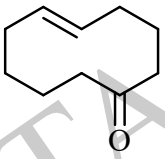
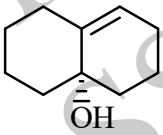
14. The major product X (based on the preferred conformation) in the reaction

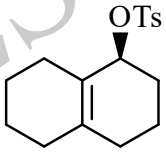


[X] is

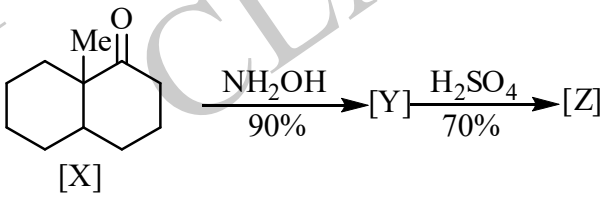
(a) 

(b) 

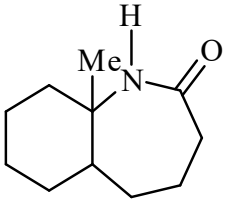
(c) 

(d) 

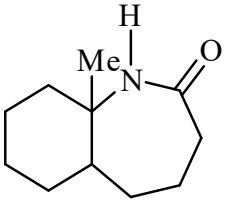
15. In the reaction sequence,



the structure of the major product Z and the overall yield for its formation from the ketone X, are

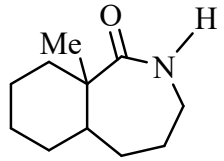
(a) 

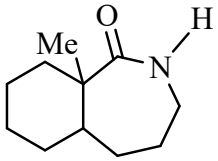
and 80%

(b) 

and 63%

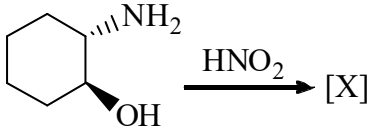
QUANTA CHEMISTRY CLASSES

(c)  and 63%

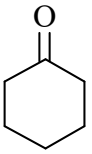
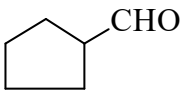
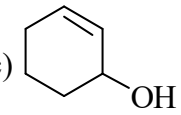
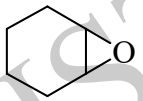
(d)  and 80%

GATE-2010

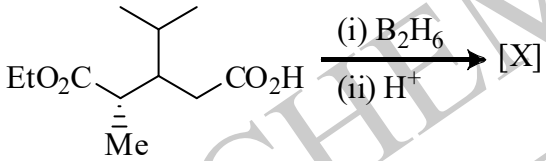
16. In the reaction,



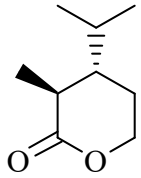
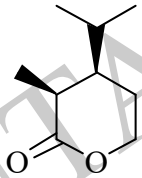
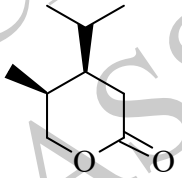
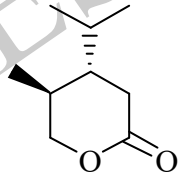
the major product [X] is:

(a)  (b)  (c)  (d) 

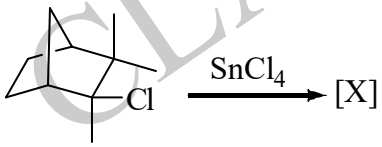
17. In the reaction



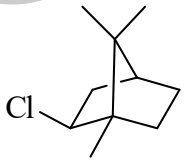
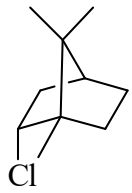
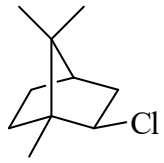
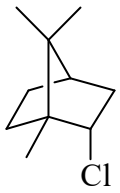
the major product [X] is:

(a)  (b)  (c)  (d) 

18. In the reaction,

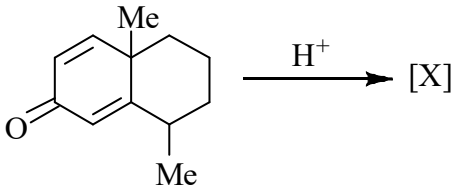


the major product [X] is

(a)  (b)  (c)  (d) 

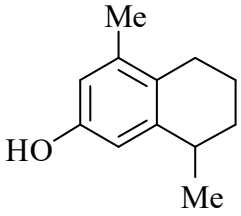
GATE-2011

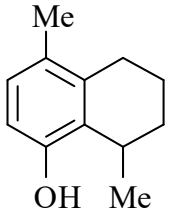
19. In the following reaction,

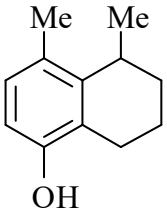


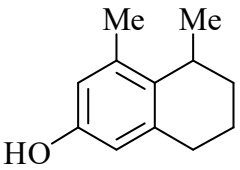
QUANTA CHEMISTRY CLASSES

the major product [X] is:

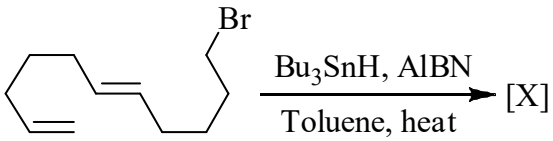
(a) 

(b) 

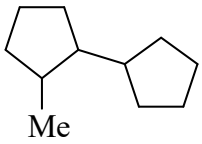
(c) 

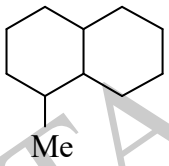
(d) 

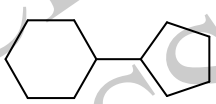
20. In the following reaction,

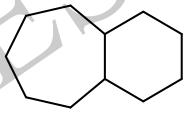


the major product [X] is:

(a) 

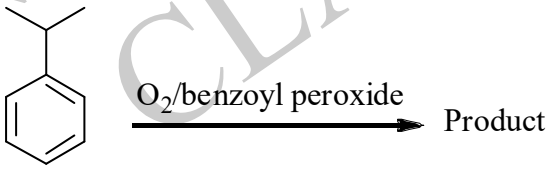
(b) 

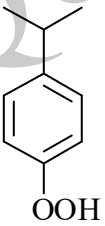
(c) 

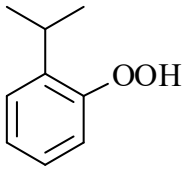
(d) 

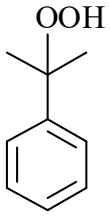
GATE-2012

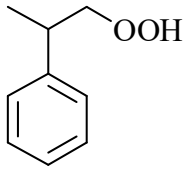
21. Identify the most probable product in the given reaction



(a) 

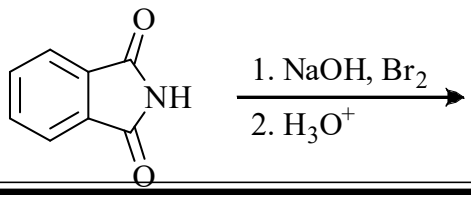
(b) 

(c) 

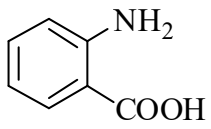
(d) 

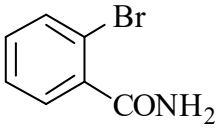
GATE-2013

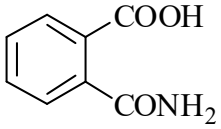
22. The major product formed in the reaction given below is:

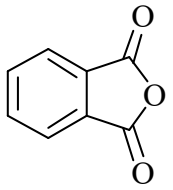


QUANTA CHEMISTRY CLASSES

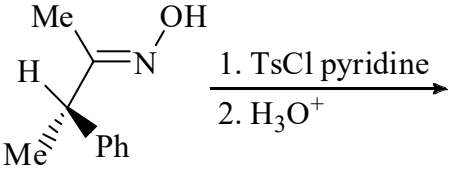
(a) 

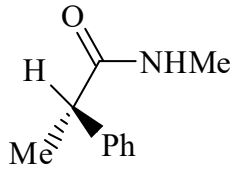
(b) 

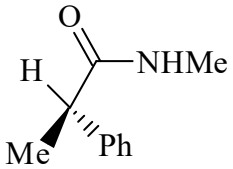
(c) 

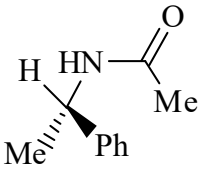
(d) 

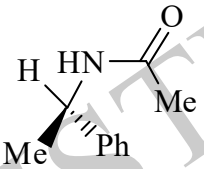
23. The major product formed in the Beckmann rearrangement of the compound given below is:



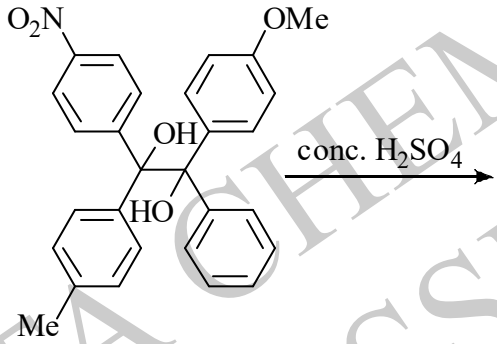
(a) 

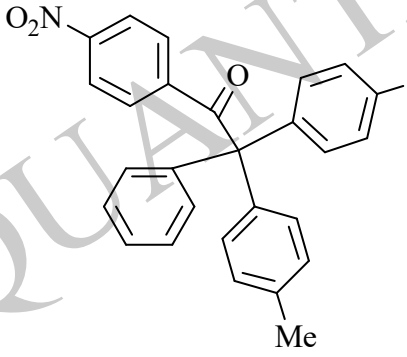
(b) 

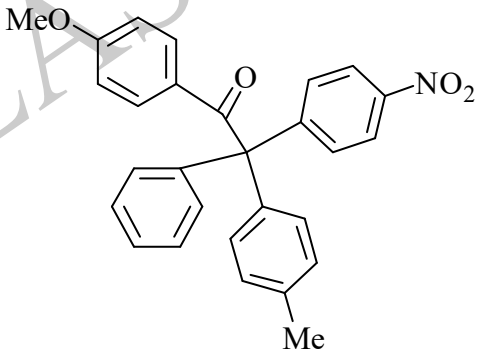
(c) 

(d) 

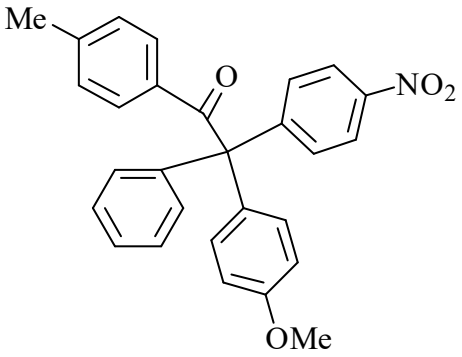
24. The major product formed in the reaction given below is

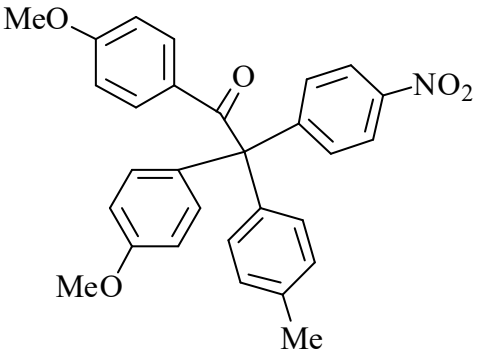


(a) 

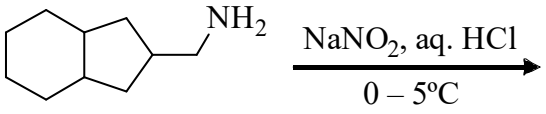
(b) 

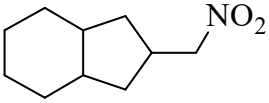
QUANTA CHEMISTRY CLASSES

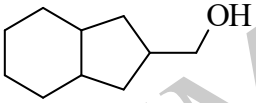
(c) 

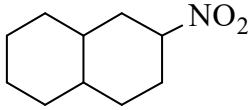
(d) 

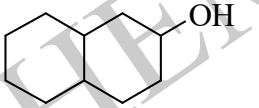
24. The major product formed in the reaction given below is



(a) 

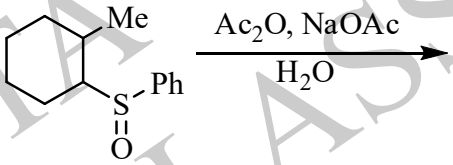
(b) 

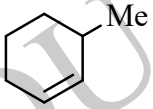
(c) 

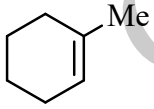
(d) 

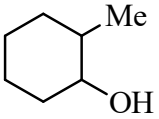
GATE-2015

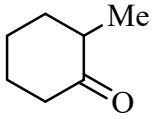
26. The major product formed in the following reaction is



(a) 

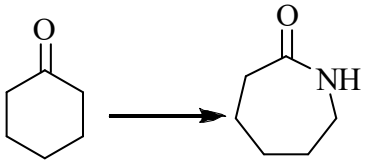
(b) 

(c) 

(d) 

GATE-2016

27. The following synthetic transformation can be achieved using



Reagents:

(p) (i) NH_2OH/H^+, (ii) H_2SO_4

(q) NH_3/H^+

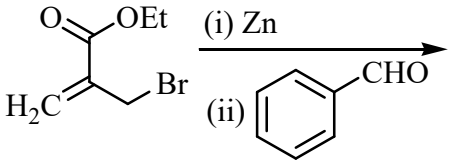
(r) (i) NH_2OH/H^+, (ii) NaOH

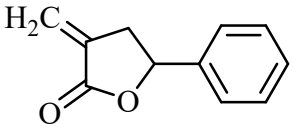
(a) p only (b) p and q (c) q and r (d) r only

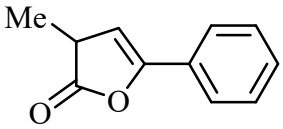
QUANTA CHEMISTRY CLASSES

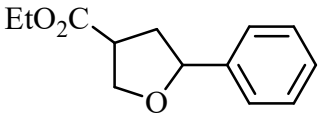
GATE-2020

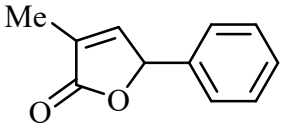
28. Major product formed in the following transformation is



(a) 

(b) 

(c) 

(d) 

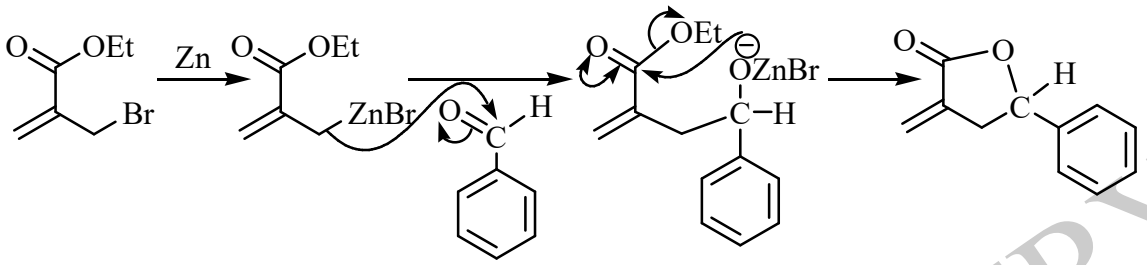
ANSWER KEY

1.	(d)	2.	(b)	3.	(a)	4.	(d)	5.	(c)	6.	(d)	7.	(a)
8.	(d)	9.	(d)	10.	(b)	11.	(a)	12.	(b)	13.	(a)	14.	(b)
15.	(b)	16.	(b)	17.	(b)	18.	(b)	19.	(a)	20.	(c)	21.	(c)
22.	(a)	23.	(d)	24.	(a)	25.	(d)	26.	(d)	27.	(b)	28	(*)

QUANTA CHEMISTRY CLASSES

HINTS & SOLUTION

28 Sol.:



QUANTA CHEMISTRY CLASSES

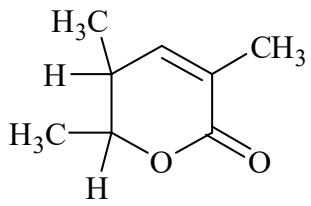
QUANTA CHEMISTRY CLASSES

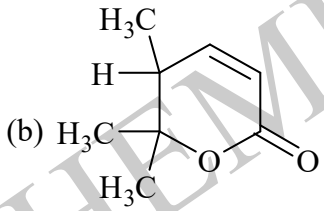
8

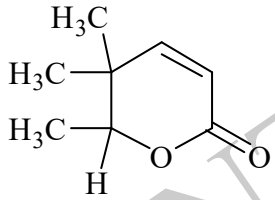
SPECTROSCOPY

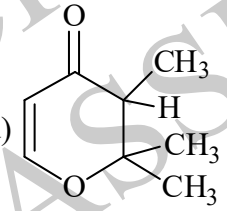
GATE-2005

1. ^{1}H NMR spectrum of [18]– annulene shows
   (a) Only one peack at δ 7.2 (18 H)
   (b) Only one peak at δ 5.0 (18 H)
   (c) Two peaks at δ 9.0 (12 H) and δ – 3.0 (6 H)
   (d) Two peaks at δ 9.0 (6 H) and δ – 3.0 (12 H)
2. An organic compound having molecular formula $C_8H_{12}O_2$ exhibits the following peacks in IR and ^{1}H NMR spectra.
   IR : 1720 (cm^{-1})
   ^{1}H NMR : 6.95 (1H, d, J = 8.5 Hz) 5.90 (1H, d, J = 8.5 Hz), 4.53 (1H, q, J = 6 Hz), 1.41 (3H, d, J = 6 Hz), 1.20 (3H, s), 1.15 (3H, s)

(a) 

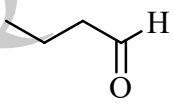
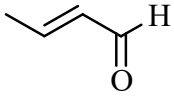
(b) 

(c) 

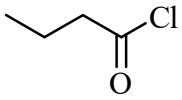
(d) 

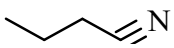
GATE-2006

3. Match the compounds in List-I with the stretching frequencies (cm^{-1}) of the principal functional groups given in List-II

List-I	**List-II**
(1) 	(i) 2240
(2) 	(ii) 1795

QUANTA CHEMISTRY CLASSES

(3)  (iii) 1750

(4)  (iv) 1725

(v) 1695

(a) 1-iii, 2-iv, 3-i, 4-v (b) 1-iii, 2-iv, 3-ii, 4-v (c) 1-iv, 2-v, 3-ii, 4-i (d) 1-iv, 2-iii, 3-v, 4-i

4. Which of the following set of characteristic NMR signals iwll be compatible with the structure of P in the above reaction?

(a) δ7.18 (d, J = 6 Hz, 2H), 7.01 (d, J = 6 Hz, 2H), 6.41 (d, J = 18 Hz, 1H)

(b) δ7.11 (d, J = 6 Hz, 1H), 7.10 (s, 1H), 7.09 (t, J = 5 Hz, 1H)
6.94 (d, J = 5 Hz, 1H), 6.41 (d, J = 17 Hz, 1H)

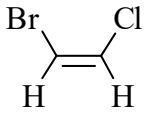
(c) δ7.18 (d, J = 6 Hz, 2H), 7.01 (d, J = 6 Hz, 2H), 6.35 (d, J = 9 Hz, 1H)

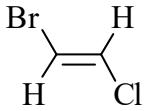
(d) δ7.11 (d, J = 6 Hz, 1H), 7.10 (s, 1H), 7.09 (t, J = 5 Hz, 1H),
6.94 (d, J = 5 Hz, 1H), 6.35 (d, J = 10 Hz, 1H)

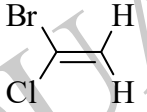
GATE-2007

5. Match the structure in List – I with the coupling constant $\left[{}^{1}H\ J(Hz)\right]$ given in List – II

List – I **List – II**

(1)  (i) ~ 1Hz

(2)  (ii) ~ 10 Hz

(3)  (iii) ~ 15 Hz

(a) 1 – (i), 2 – (ii), 3 – (iii) (b) 1 – (ii), 2 – (iii), 3 – (i)
(d) 1 – (iii), 2 – (ii), 3 – (i) (d) 1 – (iii), 2 – (i), 3 – (ii)

6. Match the observed principal absoprtions in the visible spectrum shown List – I with the bond show this absorption in List – II

List – I **List – II**

(1) $\sigma \rightarrow \sigma^{*}$ (i) C – C

(2) $n \rightarrow \sigma^{*}$ (ii) C – O

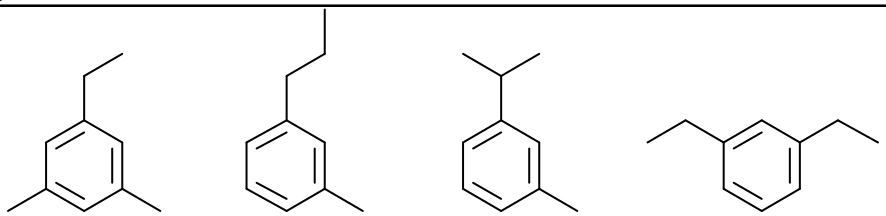
(3) n, π^{*} (iii) C = O

(4) π, π^{*} (iv) C = C

(a) 1 – (i), 2 – (ii), 3 – (iii), 4 – (iv) (b) 1 – (i), 2 – (iii), 3 – (ii), 4 – (iv)
(c) 1 – (ii), 2 – (i), 3 – (iv), 4 – (iii) (d) 1 – (iv), 2 – (ii), 3 – (iii), 4 – (i)

7. Among the isomers $C_{10}H_{14}$ shown,

QUANTA CHEMISTRY CLASSES

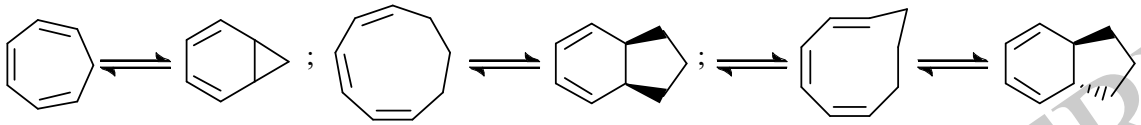


P Q R S

the isomer that can be identified uniquely by mass spectrometry alone is:

(a) P (b) Q (c) R (d) S

8. The direction of rotation of the following thermal electrocyclic ring closures.



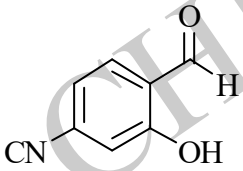
respectively is:

(a) Disrotory, disrotatory, disrotatory (b) Conrotatory, conrotatory, conrotatory

(c) Disrotatory, disrotatory, conrotatory (d) Disrotatory, conrotatory, disrotatory

GATE-2008

9. The IR stretching frequencies (cm^{-1}) for the compound X are as follows: 3300 – 3500 (s, br); 3000 (m); 2225 (s); 1680 (s).



The correct assignment of the absorption bands is:

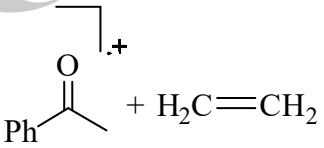
(a) $\overline{v}_{(OH)} = 3300-3500; \overline{v}_{(CH)} = 3000; \overline{v}_{(CN)} = 2225; \overline{v}_{(CO)} = 1680$

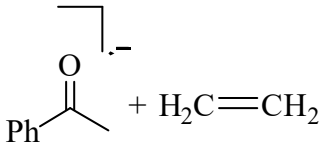
(b) $\overline{v}_{(OH)} = 3000; \overline{v}_{(CH)} = 3300-3500; \overline{v}_{(CN)} = 2225; \overline{v}_{(CO)} = 1680$

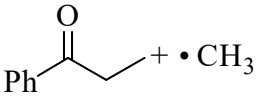
(c) $\overline{v}_{(OH)} = 3300-3500; \overline{v}_{(CH)} = 3000; \overline{v}_{(CN)} = 1680; \overline{v}_{(CO)} = 2225$

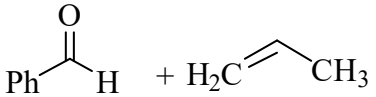
(d) $\overline{v}_{(OH)} = 3000; \overline{v}_{(CH)} = 3300-3500; \overline{v}_{(CN)} =; 1680\overline{v}_{(CO)} = 2225$

10. The most probable fragmentation observed in the electron impact ionization (EI) mass spectrometry is:

(a) 

(b) 

(c) 

(d) 

11. The product P shows 'm' and 'n' number of signals in ^{1}H and ^{13}C NMR spectra, respectively. The values of 'm' and 'n' are

(a) m = 3 and n = 2 (b) m = 2 and n = 3 (c) m = 2 and n = 2 (d) m = 4 and n = 3

GATE-2009

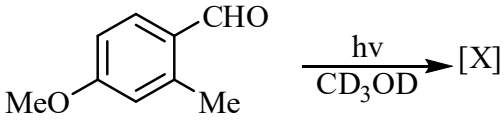
12. The number of signals that appear in the broad-band decoupled ^{13}C NMR spectrum of ortho-, meta-and para-dichlorobenzenes, respectively, are

QUANTA CHEMISTRY CLASSES

(a) 3, 4 and 2 (b) 3, 3 and 2

(c) 4, 4 and 2 (d) 3, 4 and 4

13. In the photochemical reaction

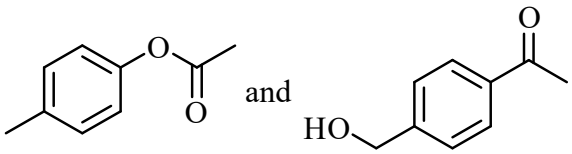


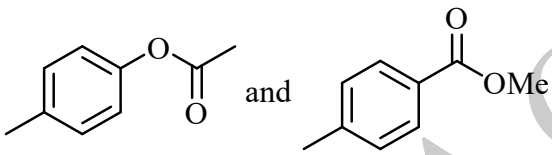
formation of the compound X can be inferred by the disappearance of the ^{1}H NMR signal at ^{1}H NMR spectrum of the starting material:

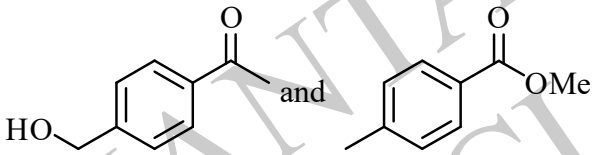
δ 9.7 (1H, s), 7.8 (1H, d, J = 8.0 Hz), 7.1–6.8 (2H, m), 3.9 (3H, s), 2.5 3H, s) ppm]

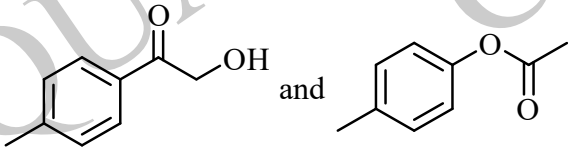
(a) δ 9.7 ppm (b) δ 7.8 ppm (c) δ 3.9 ppm (d) δ 2.9 ppm

14. Compounds Y and Z, respectively, are

(a)  and

(b)  and

(c)  and

(d)  and

15. Compound Y and Z can be differentiated by carrying out basic hydrolysis, because

(a) Y produces 4-methylphenol and Z is unaffected.

(b) Y produces 4-methylpheno and Z produces 4-methylbenzoic acid.

(c) Y is unaffected and Z produces 4-methylbenzoic acid.

(d) Y is unaffected and Z produces 4-methylphenol.

GATE-2010

16. The metal – ion along with its oxidation state and the number of unpaired electron present are
(a) Fe(II) and 4(b) Mn(II) and 5 (c) Fe(III) and 1 (d) Fe(III) and 5

17. The complex is

QUANTA CHEMISTRY CLASSES

(a) $\left[Mn(H_2O_6)\right]^{2+}$ (b) $\left[Fe(CN)_6\right]^{3-}$ (c) $\left[Fe(H_2O)_6\right]^{2+}$ (d) $\left[Fe(H_2O)_6\right]^{3+}$

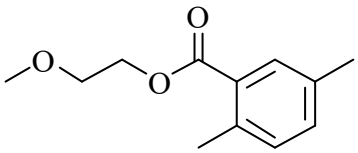
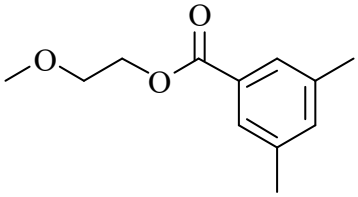
Common Data for Q. 50 and Q. 51

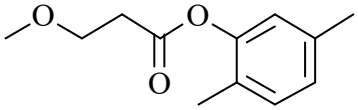
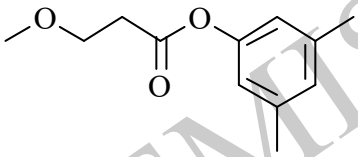
An organic compound $[X](C_{12}H_{16}O_3)$ exhibits the following spectral data IR : – 1720 cm^{-1}

^1H NMR : 2.35 (s, 6H), 3.30 (s, 3H), 3.83 (t, 2H), 4.42 (t, 2H), 7.07 (s, 1H), 7.58 (s, 2H)

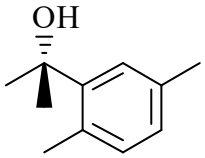
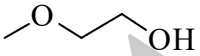
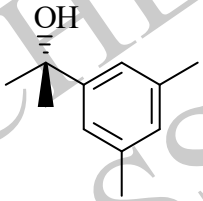
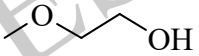
The compound [X] with an excess of MeMgBr gives a 1 : 1 mixture of compounds [Y] and [Z]. The compound [Z] exhibits the following ^1H NMR data: 2.0 (bs, 1H), 3.30 (s, 3H), 3.56 (t, 2h), 3.70 (t, 2H)

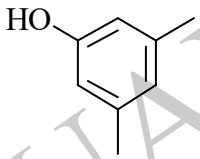
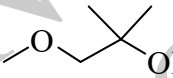
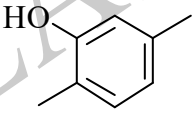
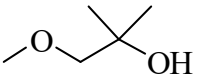
18. The compound [X] is:

(a)  (b) 

(c)  (d) 

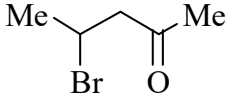
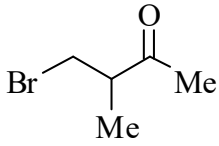
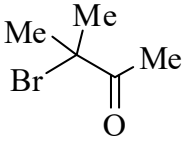
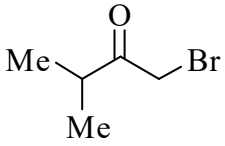
19. The compound [Y] is:

(a)  and  (b)  and 

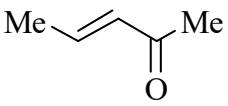
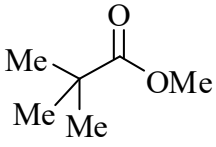
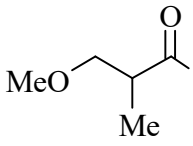
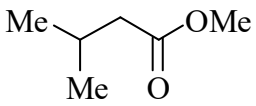
(c)  and  (d)  and 

GATE-2011

20. The compound [X] is:

(a)  (b)  (c)  (d) 

21. The major product [Y] is:

(a)  (b)  (c)  (d) 

GATE-2012

22. In the proton decoupled ^{13}C NMR spectrum of 7 – norbornanone, the number of signals obtained is

(a) 7 (b) 3 (c) 4 (d) 5

QUANTA CHEMISTRY CLASSES

23. The ratio of relative intensities of the two molecular ion peaks of methyl bromide (CH_3Br) in the mass spectrum is:

(a) $M^+ : (M+2)^+ = 1:3$ (b) $M^+ : (M+2)^+ = 3:1$

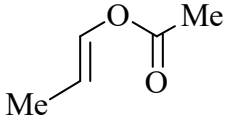
(c) $M^+ : (M+2)^+ = 1:1$ (d) $M^+ : (M+2)^+ = 1:2$

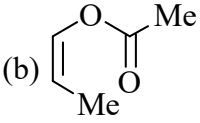
GATE-2013

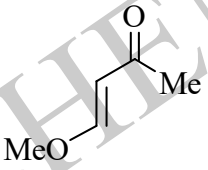
24. The number of signals that appear in the proton decoupled ^{13}C NMR spectrum of benzonitrile (C_7H_5N) is _____

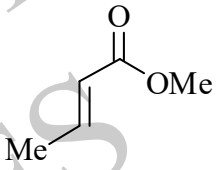
25. Among the compound given in the option (a) to (d), the one that exhibits a sharp band at around 3300 cm^{-1} in the IR spectrum is:
(a) 1, 2 – butadiene (b) 1, 3 – butadiene (c) 1 – butyne (d) 2 – butyne

26. An organic compound Q exhibited the following spectral data:
IR: 1760 cm^{-1}
^1H NMR : δ (ppm) : 7.2 (1H, d, J = 16.0 Hz), 5.1 (1H, m), 2.1 (3H, s), 1.8 (3H, d, J = 7.0 Hz)
^{13}C NMR : δ (ppm) : 170 (carbonyl carbon),
Compound Q is

(a) 

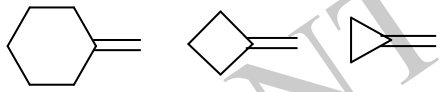
(b) 

(c) 

(d) 

GATE-2014

27. The correct order of IR stretching frequency of the C=C in the following olefins is



(I) (II) (III)

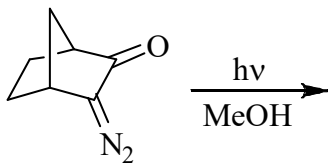
(a) I > II > III (b) II > III > I (c) III > II > I (d) III > I > II

28. The set of protons (underlined) in $CH_3CH_2CH_2OCH_3$ that would exhibit different splitting patterns in high (500 MHz) and low (60 MHz) field ^1H NMR, is

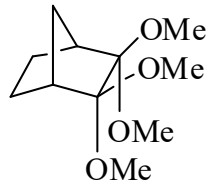
(a) $C\underline{H}_3CH_2CH_2OCH_3$ (b) $CH_3C\underline{H}_2CH_2OCH_3$

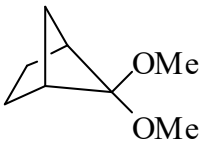
(c) $CH_3CH_2C\underline{H}_2OCH_3$ (d) $CH_3CH_2CH_2OC\underline{H}_3$

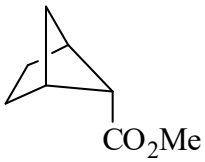
29. The product of the following reaction gave 6 line ^{13}C NMR spectrum with peaks at δ 175, 52, 50, 46, 37, 33 ppm. The structure of the product is

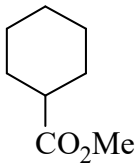


QUANTA CHEMISTRY CLASSES

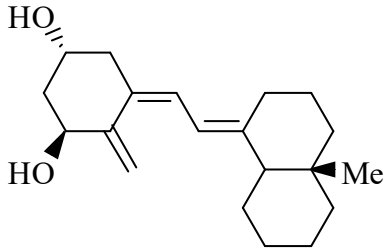
(a) 

(b) 

(c) 

(d) 

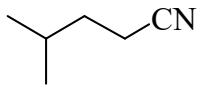
30. Given the fact that 1, 3-butadiene has a UV absorption of 217nm, the absorption wavelength (in nm) for the conjugated system shown below is _____



(Use these absorption value for auxochromic groups:

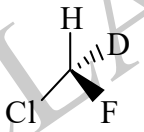
alkyl: +5; exo-cyclic double bond: +5; every additional conjugated C = C : + 30)

31. The m/z value of the detectable fragment formed by McLafferty like rearrangement of the following compound in mass spectrometer is _____



GATE-2016

32. The total number of lines expected (due to spin-spin coupling of proton with fluorine and deuterium nuclei) in the ^{1}H NMR spectrum of the following compound is _____.



GATE-2017

33. The ^{13}C NMR spectrum of acetone – d_6 has a signal at 30 ppm as a septet in the intensity ratio

(a) 1 : 6 : 15 : 20 : 15 : 6 : 1 (b) 1 : 3 : 6 : 7 : 6 : 3 : 1

(c) 1 : 2 : 3 : 5 : 3 : 2 : 1 (d) 1 : 3 : 7 : 10 : 7 : 3 : 1

34. The spectroscopic data for an organic compound with molecular formula $C_{10}H_{12}O_2$ are given below. IR band around 1750 cm^{-1}. ^{1}H NMR δ 7.3 (m, 5H), 5.85 (q, 1H, J = 7.2 Hz), 2.05 (s, 3H), 1.5 (d, 3H, J = 7.2 Hz) ppm. the compound is

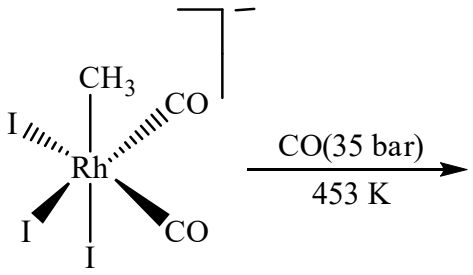
(a) methyl 2 – phenylpropionate (c) 1 – (phenylethyl) acetate

(c) 2 – (phenylethyl) acetate (d) methyl 3 – phenylpropionate

GATE-2018

35. the elimination product of the following reaction is

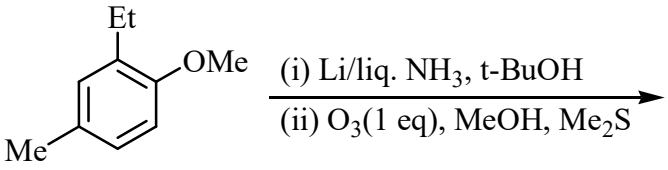
QUANTA CHEMISTRY CLASSES

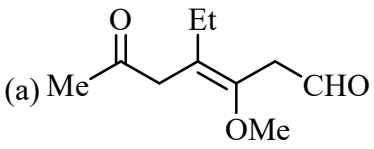


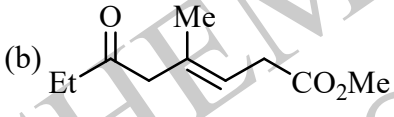
(a) I_2 (b) CH_3I (c) CH_3COI (d) I_3^-

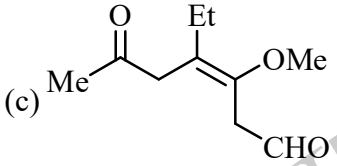
GATE-2020

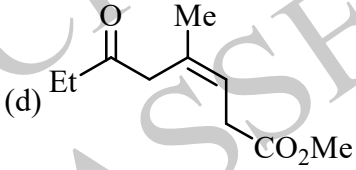
36. Major product formed in the following reaction sequence is:



(a) 

(b) 

(c) 

(d) 

GATE-2021

37. Consider two rectangular sheets, Sheet M and Sheet N of dimensions 6 cm × 4 cm each.

Folding operation 1: The sheet is folded into half by joining the short edges of the current shape.

Folding operation 2: The sheet is folded into half by joining the long edge of the current shape.

Folding operation 1 is carried out on sheet M three times.

Folding operation 2 is carried out on sheet N three times.

The ratio of perimeters of the final folded shape of sheet N to the final folded shape of sheet M is_____.

(a) 3 : 2 (b) 5 : 13 (c) 7 : 5 (d) 13 : 7

QUANTA CHEMISTRY CLASSES

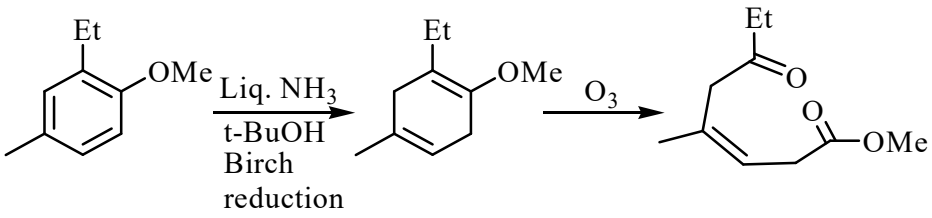
ANSWER KEY

1.	(c)	2.	(c)	3.	(c)	4.	(d)	5.	(b)	6.	(a)	7.	(b)
8.	(a)	9.	(a)	10.	(d)\	11.	(a)	12.	(a)	13.	(a)	14.	(b)
15.	(b)	16.	(d)	17.	(d)	18.	(d)	19.	(b)	20.	(d)	21.	(b)
22.	(b)	23.	(c)	24.	(5)	25.	(c)	26.	(a)	27.	(c)	28.	(b)
29.	(c)	30.	(282)	31.	(41)	32.	(6)	33.	(b)	34.	(b)	35.	(c)
36.	(*)	37.	(*)										

QUANTA CHEMISTRY CLASSES

HINTS & SOLUTION

35. Sol.:



QUANTA CHEMISTRY CLASSES

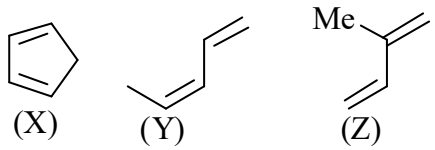
QUANTA CHEMISTRY CLASSES

9

PERICYCLIC REACTIONS & PHOTOCHEMISTRY

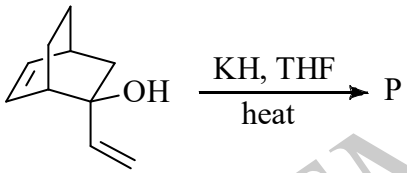
GATE-2005

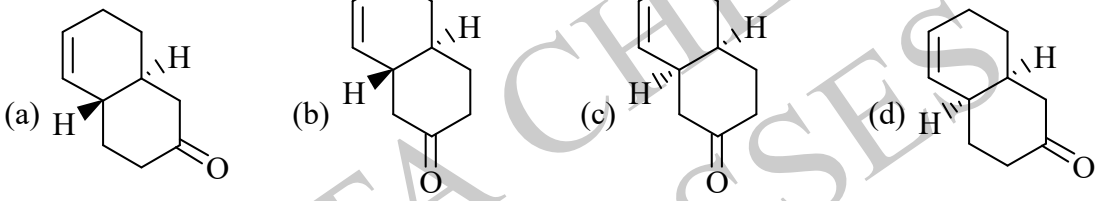
1. Order of reactivity of the following dienes X, Y and Z in Diels – Alder reaction is



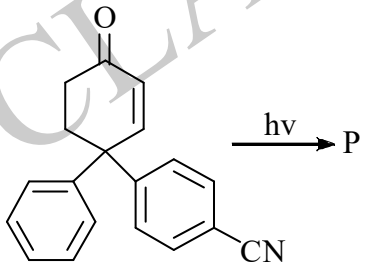
(a) X > Z > Y (b) Y > X > Z (c) Y > Z > X (d) X > Y > Z

2. The major product P of the given reaction is

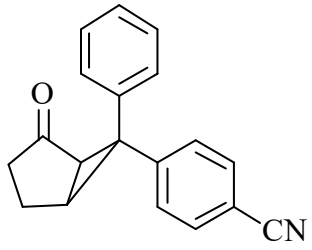


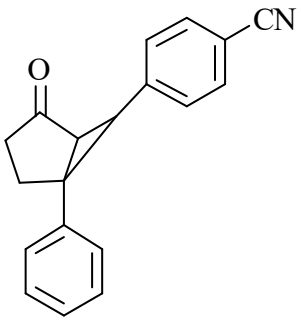


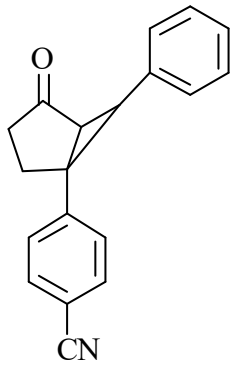
3. The major product P formed in the following photochemical reactionis

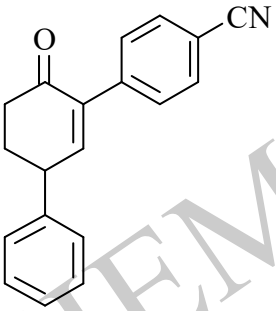


QUANTA CHEMISTRY CLASSES

(a)


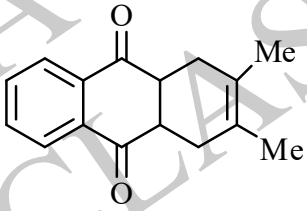
(b)


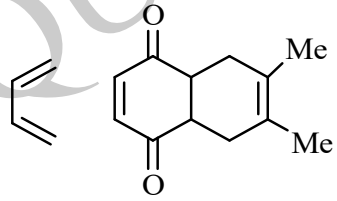
(c)


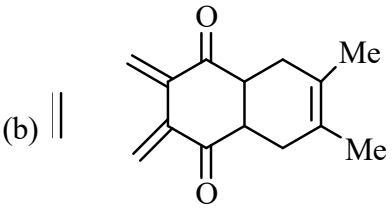
(d)


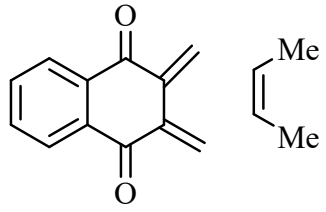
GATE-2006

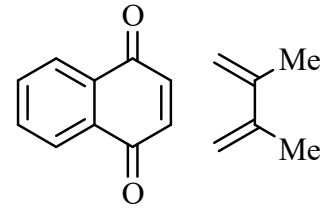
4. The most appropriate starting materials for one step synthesis of the cmpound (I) are



(a)


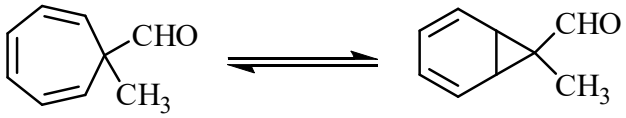
(b)


(c)


(d)


5. Select the correct classification in the following reaction from option I to IV gives below.

QUANTA CHEMISTRY CLASSES

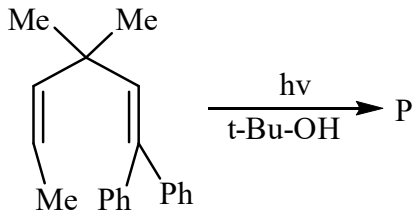


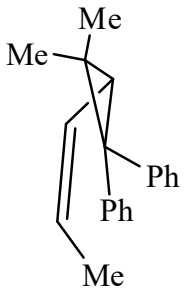
(I) Conrotatory electrocyclic reaction (II) Disrotatory electrocyclic reaction

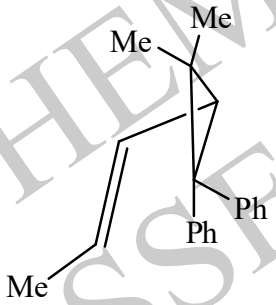
(III) Valence isomerization (IV) $\left[{}_{x}4_{s} + {}_{\pi}2_{a} \right]$ cycloaddition reaction

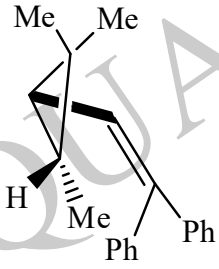
(a) I and III (b) II and IV (c) II and III (d) I and IV

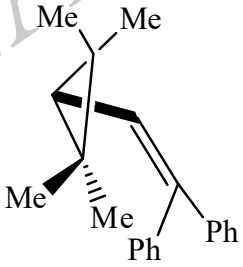
6. Identify the major product P in the following reaction.



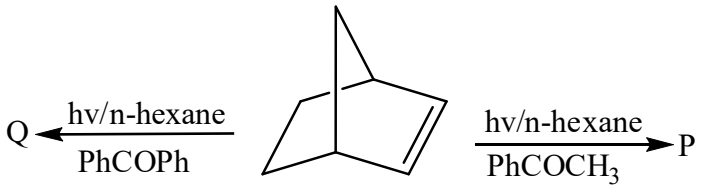
(a)


(b)


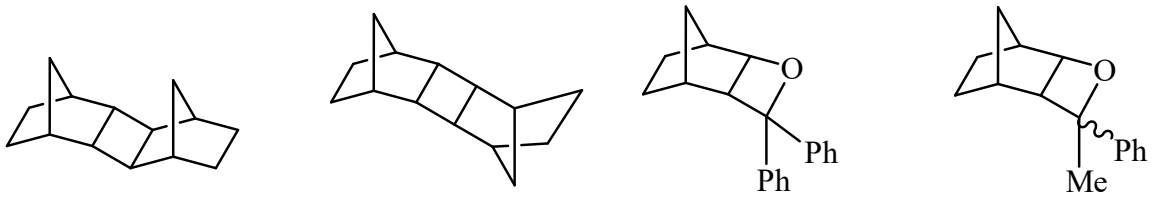
(c)


(d)


7. Identify the major product P and Q in the following reactions from the list of compounds I to IV.



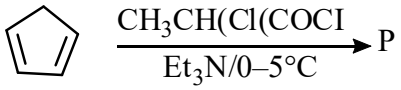
QUANTA CHEMISTRY CLASSES

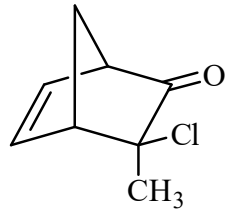
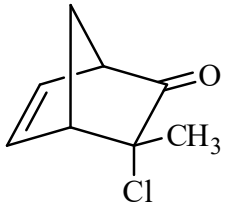
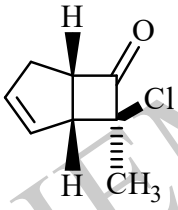
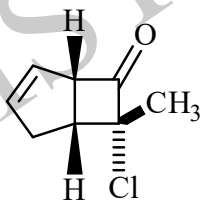


I II III IV

(a) P:I and Q:II (b) P:II and Q:III (c) P:IV and Q:II (d) P:IV and Q:III

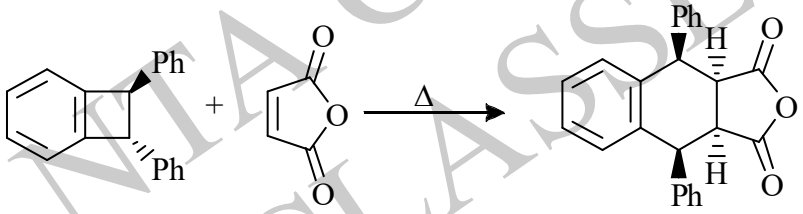
8. Identify the major product P in the following reaction



(a)  (b)  (c)  (d) 

GATE-2008

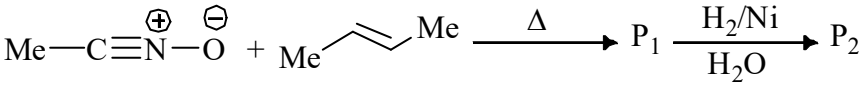
9. The reaction between X and Y to give Z proceeds via

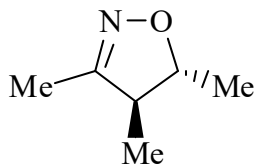
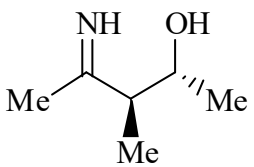


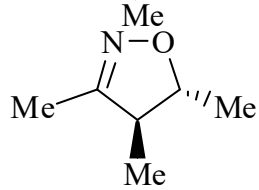
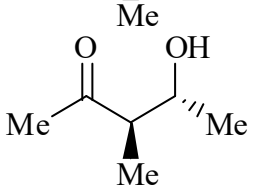
X Y Z

(a) 4π – conrotatory opening of X followed by endo Diels – Alder cycloaddition.
(b) 4π – disrotatory opening of X followed by endo Diels – Alder cycloaddition.
(c) 4π – conrotatory opening of X followed by exo Diels – Alder cycloaddition.
(d) 4π – disrotatory opening of X followed by exo Diels – Alder cycloaddition.

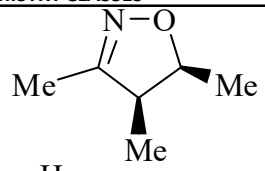
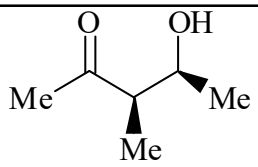
10. The major products P_1 and P_2, respectively, in the following reaction sequence are

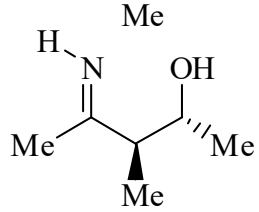
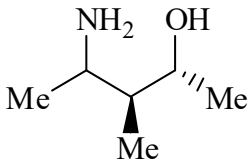


(a)  and 

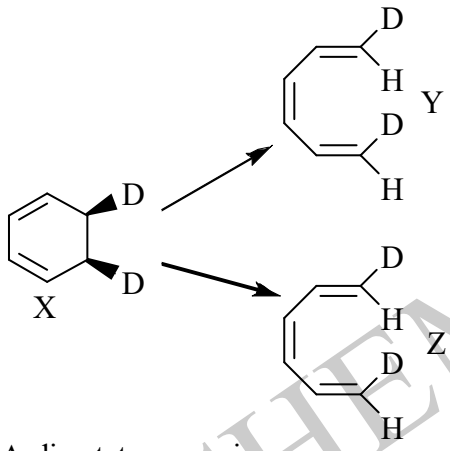
(b)  and 

QUANTA CHEMISTRY CLASSES

(c)  and 

(d)  and 

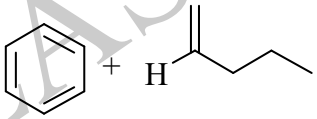
11. The products Y and Z are formed, respectively, from X via

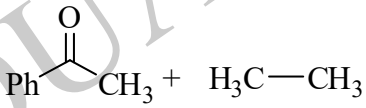


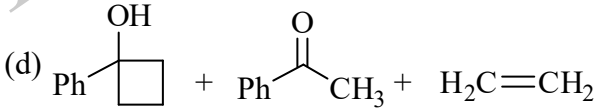
(a) hυ, conrotatory opening and Δ, disrotatory opening.
(b) hυ, disrotatory opening and Δ, conrotatory opening.
(c) Δ, conrotatory opening and hυ, disrotatory opening.
(d) Δ, disrotatory opening and hυ, conrotatory opening.

12. Photoirradiation leads to the following set of products:

(a)

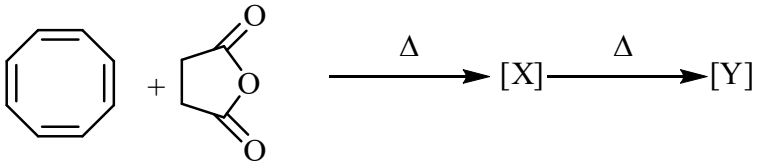
(b) 

(c) 

(d) 

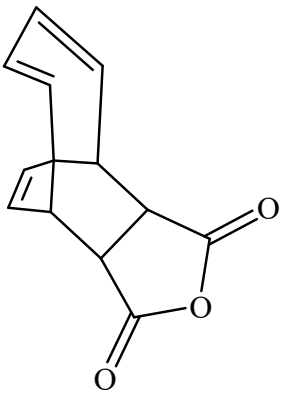
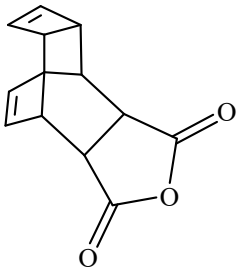
GATE-2009

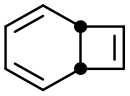
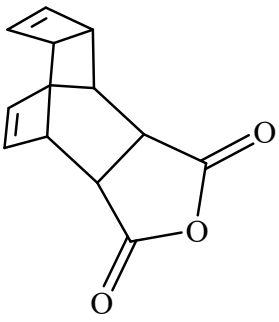
13. In the reaction sequence:

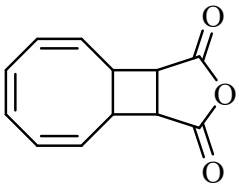
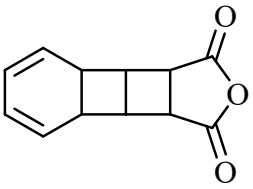


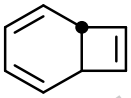
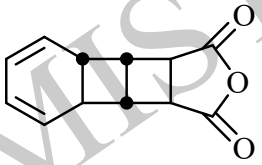
X and Y, respectively, are

QUANTA CHEMISTRY CLASSES

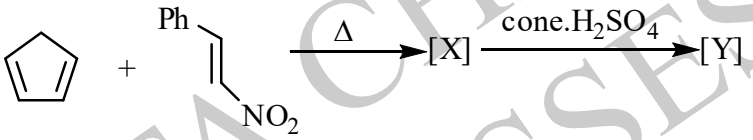
(a)  and 

(b)  and 

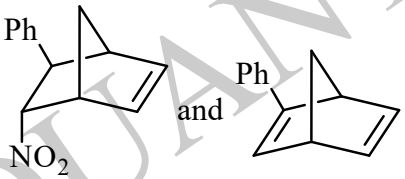
(c)  and 

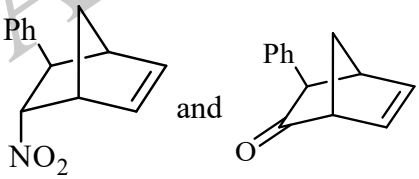
(d)  and 

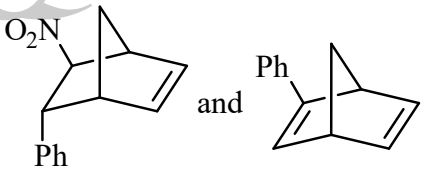
14. In the reaction sequence

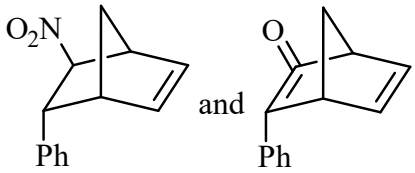


The major products X and Y, respectively are

(a) 

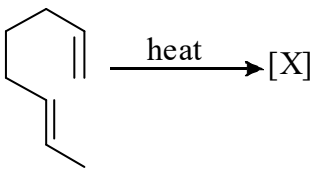
(b) 

(c) 

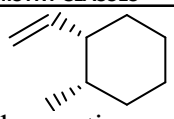
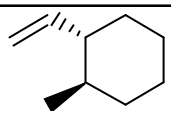
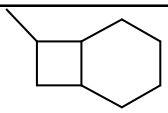
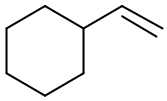
(d) 

GATE-2010

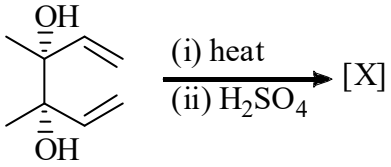
15. In the reaction,



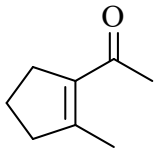
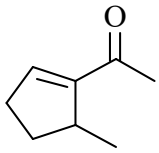
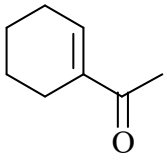
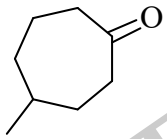
QUANTA CHEMISTRY CLASSES

(a)  (b)  (c)  (d) 

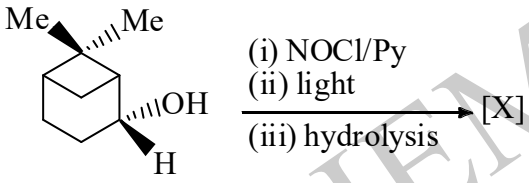
16. In the reaction,

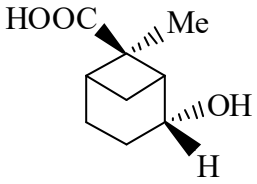
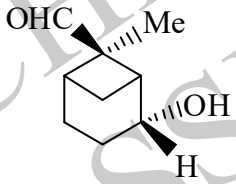


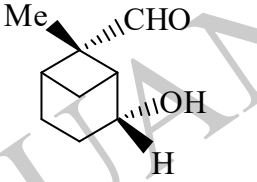
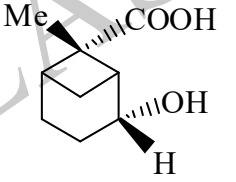
the major product [X] is:

(a)  (b)  (c)  (d) 

17. In the following reaction sequence



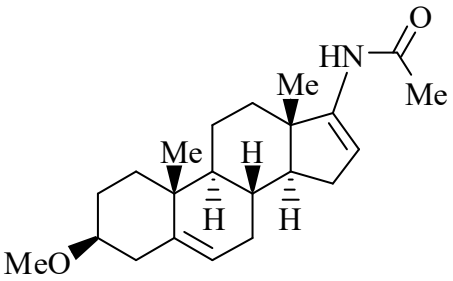
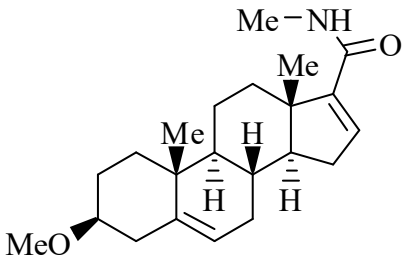
(a)  (b) 

(c)  (d) 

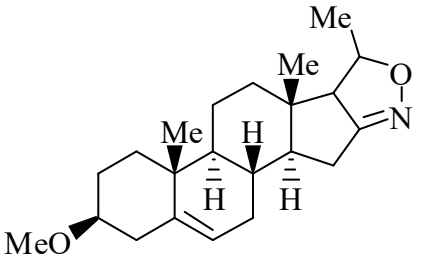
GATE-2011

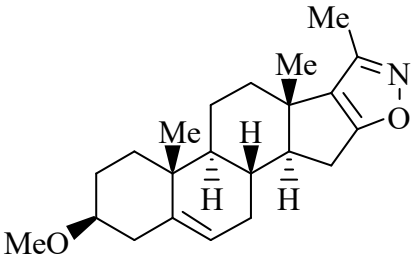
18. In the following reaction sequence

the major product [X] is:

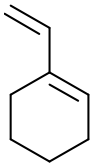
(a)  (b) 

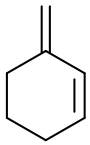
QUANTA CHEMISTRY CLASSES

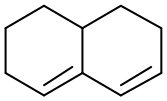
(c) 

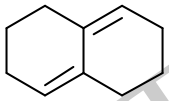
(d) 

19. The diene which undergoes Diels-Alder reaction with maleic anhydride is:

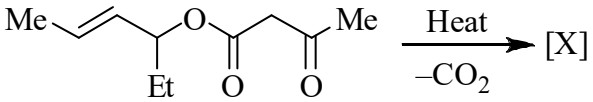
(a) 

(b) 

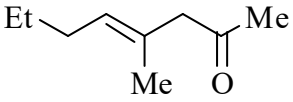
(c) 

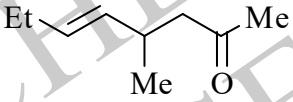
(d) 

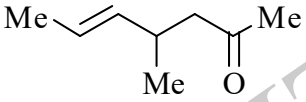
20. In the following reaction,

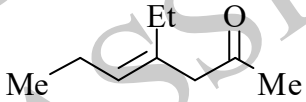


the major product [X] is:

(a) 

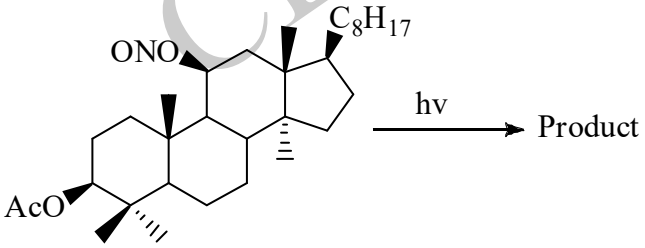
(b) 

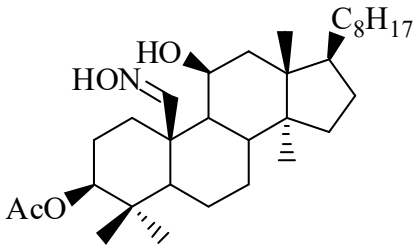
(c) 

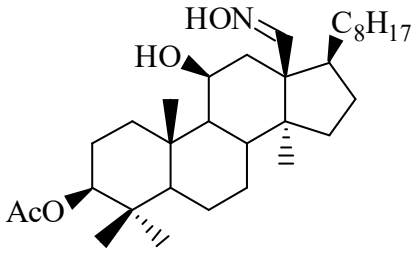
(d) 

GATE-2012

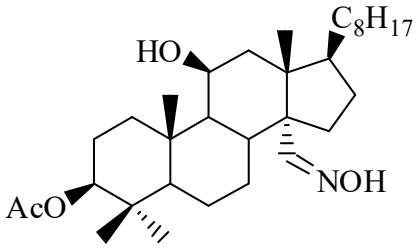
21. The product from the following reaction is

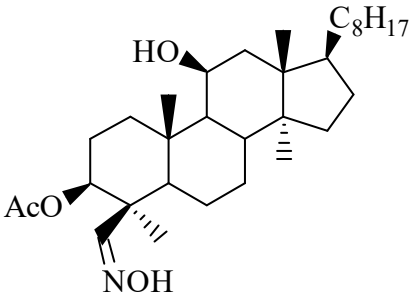


(a) 

(b) 

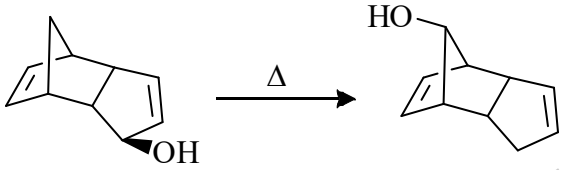
QUANTA CHEMISTRY CLASSES

(c) 

(d) 

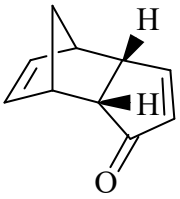
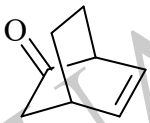
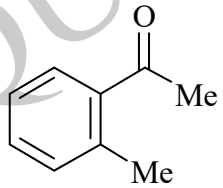
GATE-2013

22. The pericyclic reaction given below is an example of



(a) [1, 3] – sigmatropic shift (b) [1, 5] – sigmatropic shift
(c) [3, 5] – sigmatropic shift (d) [3, 3] – sigmatropic shift

23. Match the compound in the Column – I with photochemical reactions that they can undergo given in the Column – II:

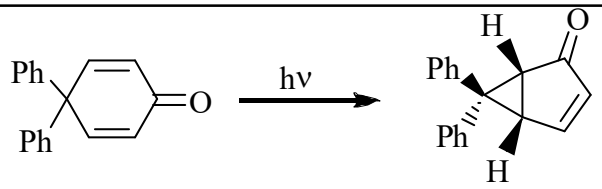
Column – I	Column – II
(i) 	(p) oxa – di – π – methane rearrangement
(ii) 	(q) Paterno – Buchi reaction
(iii) 	(r) intramolecular [2 + 2] – cycloaddition

(a) (i) – (q); (ii) – (s); (iii) – (p) (b) (i) – (r); (ii) – (p); (iii) – (s)
(c) (i) – (p); (ii) – (r); (iii) – (q) (d) (i) – (r); (ii) – (q); (iii) – s)

GATE-2014

24. Formation of the product in the following photochemical reaction involves

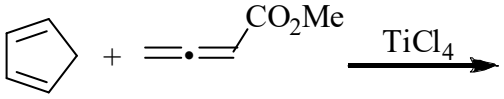
QUANTA CHEMISTRY CLASSES

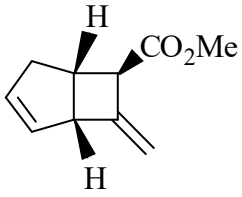


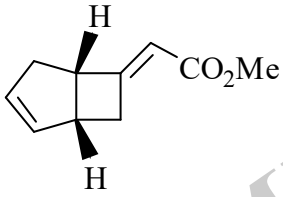
(a) di-π-methane rearrangement (b) Paterno-Buchi reaction

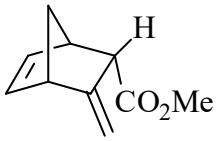
(c) [2, 3]-sigmatropic rearrangement (d) Norrish type I reaction

25. The major product formed in the following reaction is



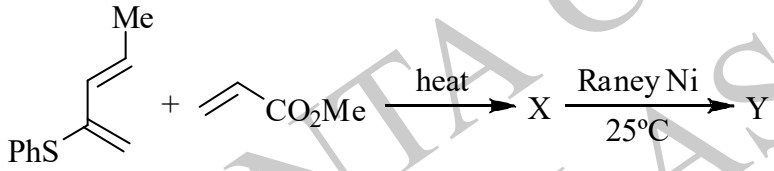
(a) 

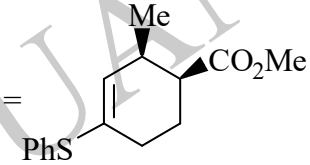
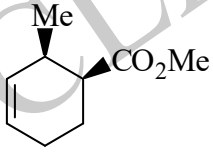
(b) 

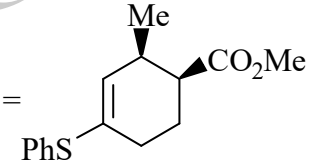
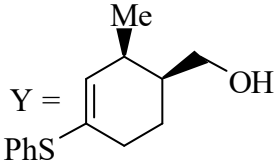
(c) 

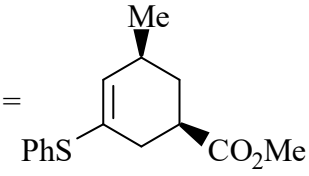
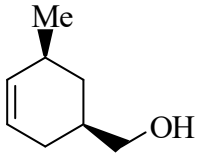
(d)

26. The major products X and Y formed in the following reaction sequence are

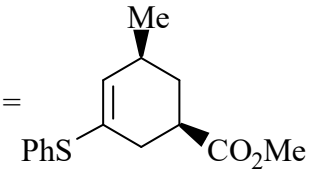


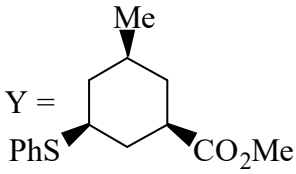
(a) X =  Y = 

(b) X =  Y = 

(c) X =  Y = 

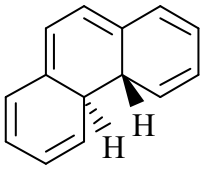
QUANTA CHEMISTRY CLASSES

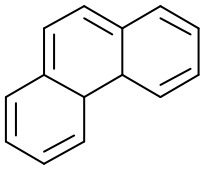
(d) X = 

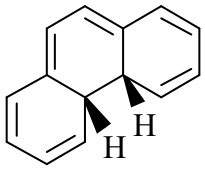
Y = 

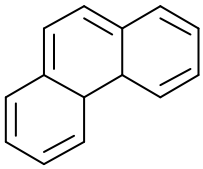
27. The major product X and Y formed in the following reaction sequence are

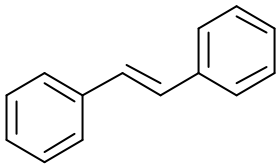
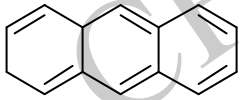
$$\text{cis – stilbene} \xrightarrow[C_6H_{12}]{h\nu} \xrightarrow[\text{air}]{I_2} Y$$

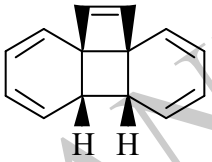
(a) X = 

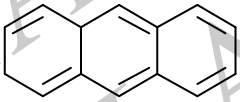
Y= 

(b) X = 

Y= 

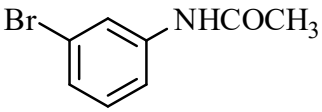
(c) X = 
Y = 

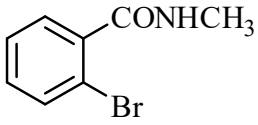
(d) X = 

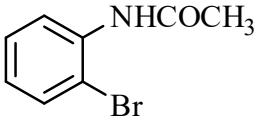
Y = 

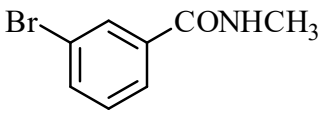
GATE-2015

28. The Beckmann rearrangement of a bromoacetophenone oxime (C_8H_8BrNO) given a major product having the following ^{1}HNMR (δ,ppm) : 9.89 (s, 1H), 7.88 (s, 1H), 7.45 (d, 1H, J = 7.2 Hz), 7.17 (m, 1H), 7.12 (d, 1H, J = 7.0 Hz), 2.06 (s, 3H). The structure of the product is.

(a) 

(b) 

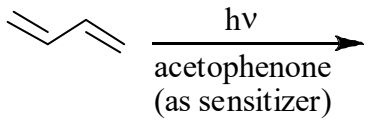
(c) 

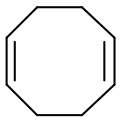
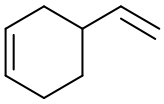
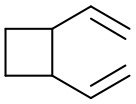
(d) 

GATE-2016

29. The major product obtained in the following reaction, is

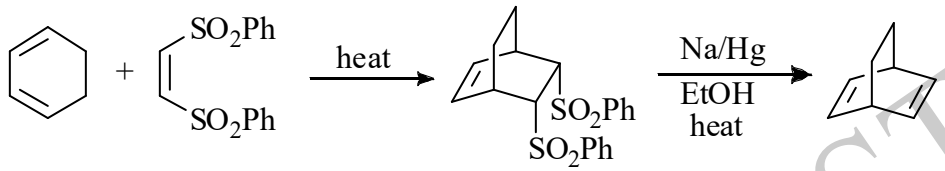
QUANTA CHEMISTRY CLASSES



(a)  (b) (c)  (d) 

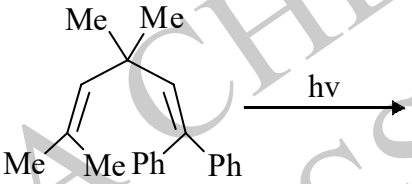
GATE-2017

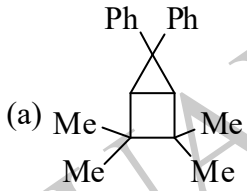
30. In the two setp reaction sequence given below, the starting bis – sulfone acts as

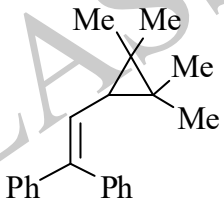


(a) a dienophile and synthetic equivalent of acetylene
(b) a dienophile and synthetic equivalent of ethylene
(c) a dipolarophile and synthetic equivalent of acetylene
(d) a dipolarophile and synthetic equivalent of ethylene

31. The product formed in the following photochemical reaction is

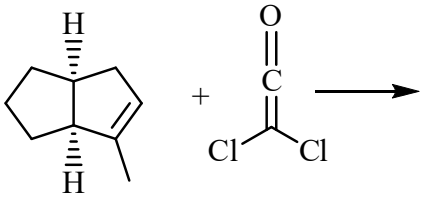


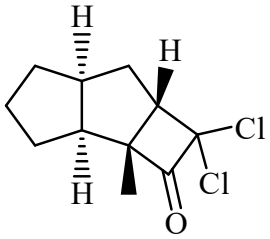
(a) 

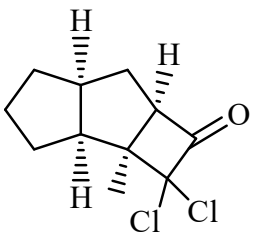
(b) 

GATE-2018

32. The major product formed in the following reaction is

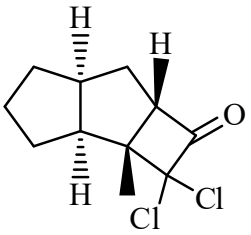


(a) 

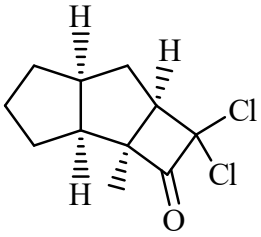
(b) 

QUANTA CHEMISTRY CLASSES

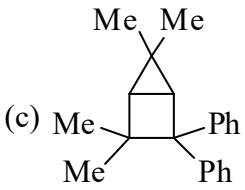
(c) d



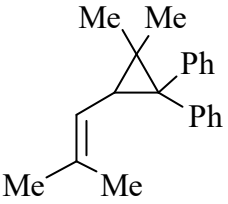
(d)



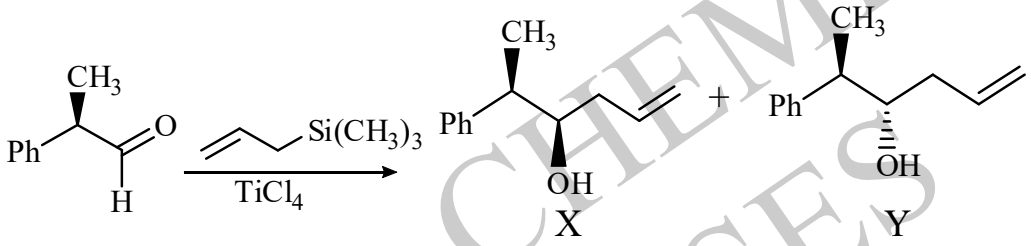
(c)



(d)



33. In the following reaction,



(a) X is the major product and Y is the minor product

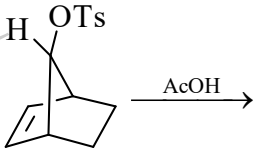
(b) X is the only product

(c) Y is the only product

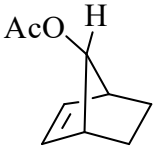
(d) X is the minor product and Y is the major product

GATE-2019

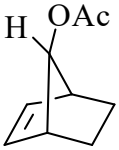
34. The major product formed in the following reaction is



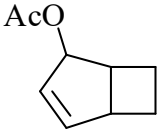
(a)



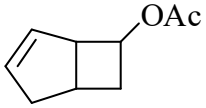
(b)



(c)



(d)



35. In a 400 MHz ^{1}H NMR spectrometer, a proton resonates at 1560 Hz higher than that of tetramethylsilane. The chemical shift value of this proton is _____ppm. (Round off to one decimal place)

(Chemical shift of tetramethylsilane is fixed at zero ppm)

QUANTA CHEMISTRY CLASSES

GATE-2021

36. Statement: Either P marries Q or X marries Y

Among the options below, the logical NEGATION of the above statement is:

(a) P marries Q and X marries Y

(b) X does not marry Y and P marries Q

(c) Neither P marries Q nor X marries Y

(d) P does not marry Q and marries Y.

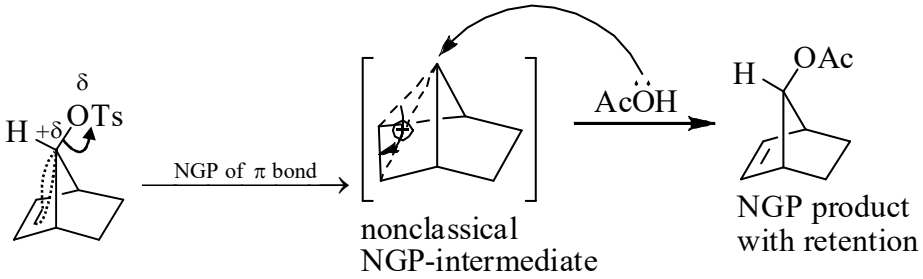
ANSWER KEY

1.	(a)	2.	(d)	3.	(b)	4.	(d)	5.	(c)	6.	(a)	7.	(c)
8.	(a)	9.	(b)	10.	(a)	11.	(d)	12.	(b)	13.	(b)	14.	(a)
15.	(a)	16.	(c)	17.	(a)	18.	(a)	19.	(b)	20.	(a)	21.	(d)
22.	(b)	23.	(a)	24.	(c)	25.	(a)	26.	(a)	27.	(a)	28.	(d)
29.	(a)	30.	(d)	31.	(d)	32.	(d)	33.	(a)				

QUANTA CHEMISTRY CLASSES

HINTS & SOLUTION

34 Sol.



35 Sol. $v_\infty = 400\ \text{MHz}$

$$\delta(\text{ppm}) = \frac{1560\ \text{Hz}}{400\ \text{MHz}} \times 10^6$$

$$\delta = \frac{1560\ \text{Hz}}{400 \times 10^6\ \text{Hz}} \times 10^6 = 3.9\ \text{ppm}$$

QUANTA CHEMISTRY CLASSES

QUANTA CHEMISTRY CLASSES

10

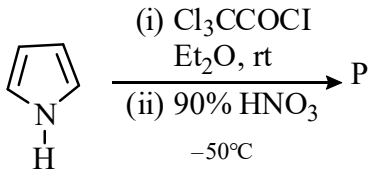
HETEROCYCLIC COMPOUNDS

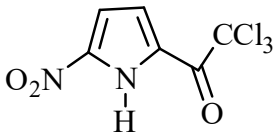
GATE-2006

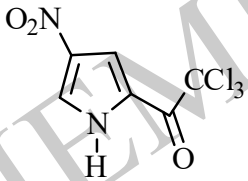
1. On heating with dilute sulfuric acid, napthalene-1 sulfonic acid gives predominantly

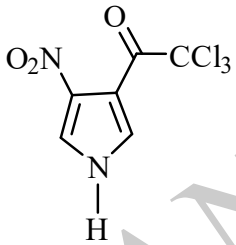
   (a) natphthalene
   (b) napthalene-2-sulfonic acid
   (c) 1-naphthol
   (d) 2-naphthol

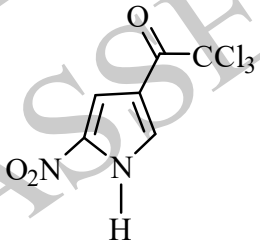
2. Identify the major P in the following two-step reaction:



(a) 

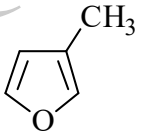
(b) 

(c) 

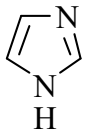
(d) 

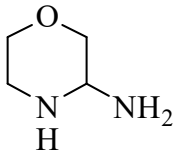
GATE-2007

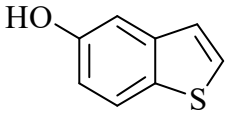
3. Match the structure in List – I with their correct names in List – II.

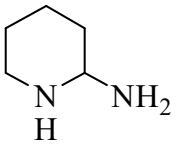
List – I	List – II
(P) 	(i) 3 – methyl furan

QUANTA CHEMISTRY CLASSES

(Q)  (ii) Imidazole

(R)  (iii) 5 – hydroxybenzothiazole

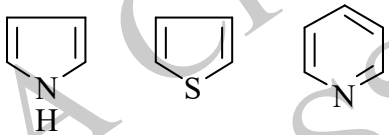
(S)  (iv) 2 – amino piperidine

(T)  (v) 2 – amino morpholine

(a) P – i, Q – ii, R – v, S – iii, T – iv (b) P – ii, Q – iii, R – iv, S – v, T – i
(c) P – iii, Q – iv, R – v, S – i, T – ii (d) P – iv, Q – v, R – i, S – ii, T – iii]

2010

4. The decreasing order of the reactivity of the following compounds towards electrophiles is

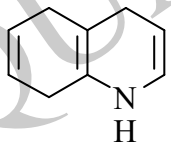
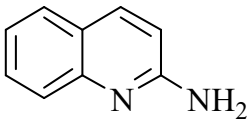


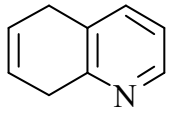
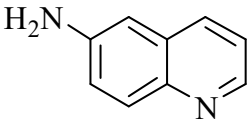
I II III

(a) II > I > III (b) II > III > I (c) III > I > II (d) I > II > III

2013

5. The major product formed in the reaction of quinoline with potassium amide (KNH_2) in liquid ammonia is:

(a)  (b) 

(c)  (d) 

GATE-2014

6. The major products X and y formed in the following reactions are

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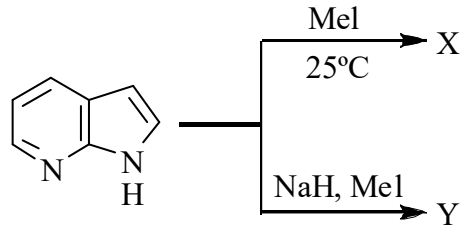
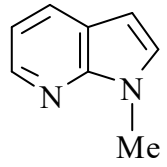
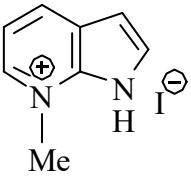
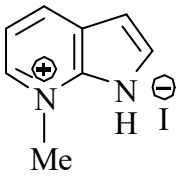
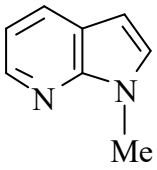
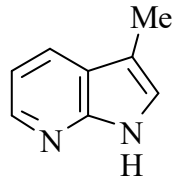
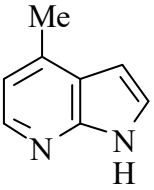
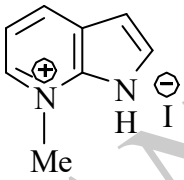
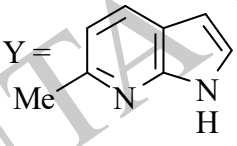


(a) X =  Y = 

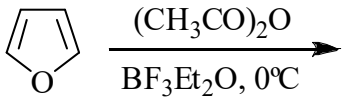
(b) X =  Y = 

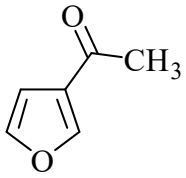
(c) X =  Y = 

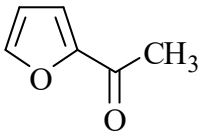
(d) X =  Y = 

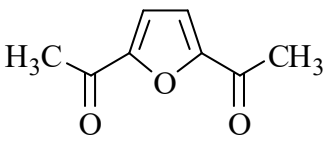
GATE-2016

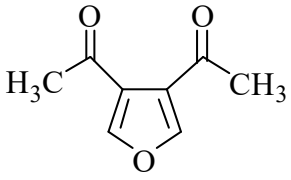
7. The major product of the following reaction is,



(a) 

(b) 

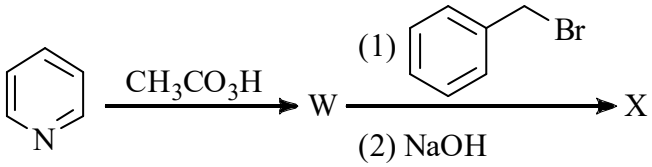
(c) 

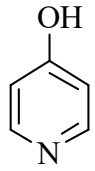
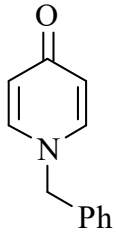
(d) 

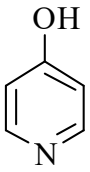
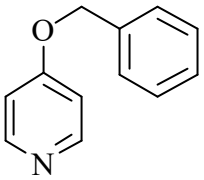
QUANTA CHEMISTRY CLASSES

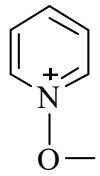
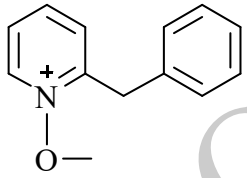
GATE-2017

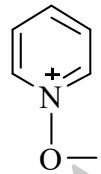
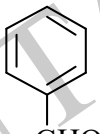
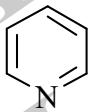
8. The structures of the major products W and X in the following synthetic scheme are



(a) W =  X = 

(b)  X = 

(c) W =  X = 

(d) W =  X =  and 

ANSWERS

1. (a) 2. (b) 3. (a) 4. (d) 5. (b) 6. (b) 7. (b)
8. (d)

QUANTA CHEMISTRY CLASSES